New England Regional Commission

Regional Transportation Needs

November 1968

Prepared for the New England Regional Commission
By Systems Analysis And Research Corporation

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A Report Prepared for the
New England Regional Commission by
Systems Analysis And Research Corporation
Cambridge, Massachusetts

This report was prepared by professional consultants under the supervision and direction of, and under contract with the New England Regional Commission. The statements, findings, and recommendations contained in the report are solely those of the consultants and do not necessarily reflect the views of the New England Regional Commission.

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Chapter I
Objective and Findings

A. OBJECTIVE

This report deals with the transportation needs of New England and the response to those needs provided by the transportation industry, with particular attention to present or impending failures in such response which are proper subjects of governmental concern. It is therefore appropriate to discuss at the outset the question of why the supply of transportation services should be a matter of concern to the government in general or the New England Regional Commission in particular. The supply of most goods and services is regulated by the market place without specific attention by the government, and it is natural to ask why transportation is different in this respect. That it is held to be different is made clear by the fact that government has exhibited interest in the form of both promotion and regulatory protection and restraint for a century or more. Both promotion and regulation have been markedly uneven as to mode* and have tremendously increased in recent years. The reason for governmental concern is not so easily expressed. Several elements, however, stand out.

1. Essentiality

That mobility of both persons and goods is essential to production at any greater level than bare subsistence needs no apologia. Mass production, especially at sophisticated levels of skill, requires the movement of (a) skilled persons to production centers, (b) raw materials to the same centers, and (c) products to a wide area of distribution. There is no material function of life which is not affected by it. This quality of essentiality alone is not, however, sufficient reason for governmental promotion or regulation. Many goods and services are essential but not the subject of particular government attention. Few things are as essential as salt, but salt seems to be amply supplied by the normal activity of the market place at a price well within the limit of demand. Essentiality, then, although certainly a part of the reason for governmental concern, is equally certainly not by itself sufficient justification.

2. Cost and Benefit

Before the industrial revolution the cost of building a highway was beyond the means of any but the sovereign. Furthermore, the benefits of improved transportation were

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*Bixler, Herbert E., "A Psychoanalytical View of the Interstate Commerce Act," _Traffic World_, September 4, 1965

held to be of general concern beyond the direct benefits to the user. Priority of land use in the form of eminent domain has long been considered both necessary and justified. Since the body politic was held to be strengthened in the whole by good communication, it followed that government had a specific interest in supplying the necessary capital investment. Natural waterways had long provided an opportunity for profitable private transportation services, but nature limited its application. On land the advent of the railroad introduced a mode whose cost was so clearly lower than the value added by its service that the profits were ample to stimulate private investment. It was an unprecedentedly high level of investment, however, and the resulting capital structure had an effect on cost fluctuation previously unknown. The great difference between total and marginal cost changed the nature of competition, while the time and cost of construction (together with high value added) afforded an opportunity for price discrimination not generally available. These effects, as well as the success and maturity of the railroad industry, led to a mixture of appeals for regulation - for restrictive regulation from liberal politicians and for protective regulation by the industry itself.*

The stultification of the railroad industry resulting from this regulation left it unable to respond to the competition which appeared with the motorization of highway vehicles following World War I. The development of the motor vehicle also led to great political pressure for improved highways at public expense, compounding the distortion of the normal workings of competition. Promotional efforts of the government in the field of aviation, beginning with efforts to provide an air mail service, but since greatly expanded into the provision of airways, airports, and some operating subsidy, further compounded the complexity of the mix of private and public investment and control. Still more complexity was added by the governmental investment in artificial inland waterways, held free of user charge by ancient law.

All of this complexity of intermodal competition, compounded by radically different cost structures in the different modes, distorted by the traditional concept of a rate structure based on discriminatory pricing, obscured by the curious and uneven mix of public and private investment, provides an explanation, even if not justification, of governmental concern. Regardless of the wisdom of its past action, government clearly cannot now suddenly ignore the transportation problem. It must rather try to bring reason and order to its approach.

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*Kolko, Gabriel, Railroads and Regulation, 1877-1916, Princeton, 1965

3. Growth of Demand

The essentiality of transportation, together with the complexity of the industry's structure outlined above, sufficiently explain governmental concern, but there is another reason relating to the planning function of government. That is the rapid growth of demand for transportation, seemingly so insatiable as not to be thwarted by increasing cost. Indeed, the high-cost modes are growing fastest. (cf. Exhibits II-13, page 49 and II-17, page 57). This is especially apparent in passenger travel. Since the fast-growing modes are air and highway transport, it is obvious that desire for speed and convenience is an important factor in this demand

New England's population, projected at an average annual growth rate of 1.3%, is expected to reach 13,800,000 persons by 1980. The region's personal income, which bears a close relationship to product and traffic volume, increasing at an average annual rate of 3.6%, will be 1.65 times 1967 levels by 1980. New England highway travel increased at an annual rate of 5.4% between 1959/60 and 1965/66, while scheduled airline passenger arrivals and departures increased 15.3%.

Between 1959/60 and 1965/66, only because air passenger miles grew at an annual rate of 11.5%, the annual growth rate for all common carriers for the U.S. as a whole was 3.2%, slightly higher than that of automobile travel, namely 3.1%. If present demand trends in the modes for intercity travel continues, personal passenger car and common carrier travel in New England in 1980 will more than double the 1966 traffic levels. This represents annual average traffic rate of growth of 5.5%.

Transport mode facilities, particularly highways and airports, are severely taxed by peak traffic demands. The availability of suitable land for such transport facilities development in areas of high population density and rapid population growth becomes increasingly a limiting factor. Further development of this forecast will be found in Chapter III.

B. FINDINGS

The findings of the report in response to the objective set forth above are summarized below. The region's needs are categorized as to present and future, with further listings of those which require continuous review, followed by a reference to the need for attention to the impact on other social values. A recapitulation of the needs directs attention to the order of urgency of governmental attention to assure the optimum allocation of available funds. All of the region's needs are more fully discussed in the body of the report, which is arranged by mode.

1. <u>Present Needs</u>

a. Freight

(1) <u>Importation of Materials from Other Regions</u>

New England must look to other regions for a large proportion of its food and animal feed, fuel, building supplies, raw material for its manufactures, and many manufactured goods which it does not produce, such as automobiles and large appliances. Even to move into the region goods which are manufactured here, good transportation is necessary to insure full competition and prevent insularity.

This need is met to a large degree by the region's rail system, with highway carriers carrying an almost equal share. Water transportation plays an important role in the transportation of fuel. Air freight represents a tiny but growing segment. Facilities in being or planned are adequate for growth and vigorous competition, and immediate governmental concern may be restricted to two particular matters. The first is the rail merger problem. For reasons detailed in Chapter II, adequate competitive rail service, essential to meet the region's needs, requires merger of the railroads of the East into two competitive systems, each serving New England. One of these is well on the way to completion, by inclusion of the New Haven in Penn Central. The other is proposed, since the N&W-C&O merger application proposes to include the B&M. The New England Regional Commission should vigorously support this merger and urge its development into a unified single road including the B&M and serving the whole area known as Official Territory, roughly bounded by Chicago, St. Louis, and central Virginia. This concern is of immediate urgency since the case is now under consideration by the Interstate Commerce Commission. This action requires no funds, but such a step should insure the continued responsiveness of the transportation system to this very important regional need.

The other occasion for governmental concern is with the encouragement of unit train rates for coal. As explained in Chapter II, the only commodity group for which New England pays rates out of line with the rest of the country is the Products of Mines group. Unit trains offer an opportunity for marked reduction in such rates, an opportunity which has been exploited less in New England than elsewhere. The Commission has an interest in making sure there is full communication between power companies, railroads, and coal producers in the interest of sound planning for future power plant construction with due concern for economics and air pollution. It is important that the Commission concern itself with the matter with reasonable promptness, but it cannot be said to be at a crisis stage.

Governmental concern for port facilities is outlined in Chapter V. The two promising areas appear to be jumbo tankers and trailerships. The need for facilities to handle such vessels cannot be precisely estimated with present knowledge, but there is a clear need for continued attention and further study.

(2) <u>Export of New England's Products to Other Regions</u>

New England must send the products of its skills to all the world. Its location in the corner of the country, farther from some important markets than some competitors, has made it exceptionally sensitive to transportation service and cost. In response to that sensitivity the transportation supplied has been good enough to enable successful competition at a cost at least not disproportionate to the rest of the country.

The motor truck is the dominant mode in the response of the transport industry to this important need. Contract and common carriers by highway carry a large share of the volume, and the private truck not only carries a substantial share but also serves as an escape from the bureaucracy toward which the railroad and regulated motor carrier industry tends. Railroads carry a relatively small share of outbound freight, but there is some indication that their share is increasing as a result of the rapid growth of trailer-on-flat-car (TOFC) service. Air freight is very small in volume, but growing rapidly as a mark of its importance to the region's high-value production. Export freight tends to move via New York, but there are some possibilities of a limited revival of movement via Boston.

The only pressing governmental concern in connection with outbound freight is to attempt to preserve and improve service for the small shipper. This is a national problem which needs a national solution. In New England, while awaiting such a solution, government may be able to encourage shippers' cooperatives, whose function is to consolidate the freight of several shippers into trailer loads which are attractive to both rail and highway carriers. A continuing regional office of transportation might be able to provide such encouragement by putting interested shippers in touch with each other and offering technical assistance in, for example, rate matters. Another specific recommendation is to urge the intermodal coordination represented by Plan V TOFC, explained in Chapter II, which helps bring the advantages of TOFC service to the small shipper through the good offices of a local trucking line. The Commission should consider seriously and soon how to encourage this development, but there is no specific deadline to be met.

(3) Distribution Within the Region

Many of New England's products are consumed within the region and those which come into the region must be distributed to the ultimate consumer. The motor carriers, common, contract, and private, perform the lion's share of this task, although rails move some large lots over longer distances. Governmental concern here relates primarily to the completion of the interstate highway system.

Freight brought into the region by rail needs some branch lines for its distribution. There is a continuing concern of government for the encouragement of short lines as exemplified by the action of Vermont in bringing the Vermont Railway into being, described in Appendix A. This concern for short lines is not urgent in its timing but of a continuing nature.

b. Passenger

(1) Highway

Since the overwhelming preference of passengers is for the private automobile, the first passenger transport need of the region is a good highway system. In general, the present and proposed interstate system appears to meet that need for the foreseeable future, except for (a) access to Boston and New York and (b) movement between these points. These two needs create governmental concern for rail commuter service and Boston-New York service which is discussed below. In the highway field, there are two general and two specific matters of concern. In general, the Commission should be concerned with the proper planning for interstate connectors and for the development of urban arterials. Both of these subjects, which are important but do not face deadlines, are discussed in Chapter III. The two specific matters of concern are the much-discussed additions to the interstate system, one an east-west highway across northern New England and the other a north-south highway in east central New England. The difficulty of making substantive recommendations concerning these proposals is explained in Chapter III, together with an explanation of the steps necessary to acquire the essential data. Clearly, decision as to action must await substantial further study.

Bus service, improved with the construction of interstate highways, has proved well adapted to the needs of the 5% of passengers who do not travel by automobile. Bus transportation appears to involve no further governmental concern than the use of the highways provided primarily for automobile traffic.

(2) Air

The need for long distance interregional travel is well supplied by the scheduled air carriers to and from New

England's major airports, assuming favorable action by the Civil Aeronautics Board on the Northern New England-Great Lakes case now under consideration, and accepting the regional airport concept recommended by the New England Council in 1961.* Specific future airport needs are documented in Chapter IV, the most pressing being Boston and Hartford. Proper governmental concern for these needs involves formation of basic policy and its application to requests for Federal aid in airport financing.

One recommended means of relief to both Boston and Hartford as well as New York is the establishment of an international jetport at the approximate midpoint of the recommended ultra-high-speed rail line between Boston and New York. Such a location would be truly regional in the breadth of its service, within reach of 80% of the region's inhabitants.

Intraregional air service has been a matter of considerable concern in the past, but the need is being met by the rapidly growing third level air carriers. Since it is apparent that these unregulated and unsubsidized carriers are succeeding where regulated and subsidized carriers failed, it is clear that governmental concern in this area is properly directed to passive encouragement with a minimum of interference.

The needs of general aviation in the region as a whole cannot be evaluated in relation to the economy in general for lack of comprehensive data. The question of provision of local facilities is best left to local determination where local benefits can best be evaluated.

(3) Rail

In northern New England there appears to be no current need for conventional rail passenger service. Future possibilities are discussed below in the section concerning future development.

The most urgent governmental concern in the rail passenger field is the need for an ultra-high-speed rail service between Boston and New York. It is urgent because of the threatened congestion of airways and highways, which may well become intolerable by the time work on the rail line is completed, even if begun now. It should be planned in coordination with highway, urban transit, and airport planning. The opportunity for use of most of the existing rail line, with probable relocation of some thirty-six miles, should

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*Thompson & Lichtner Co., "A Master Plan for Regional Airports to Serve Scheduled Air Transportation Needs of New England," prepared for the New England Council, Boston, 1961

not be lost, as it might be by location of transit and highway improvements. In all probability, the high-speed rail service should serve a new international airport for both New York and Boston, as well as the intermediate region. When railroads were new, state government within the region extended credit to the untried venture and the cash reward, entirely apart from indirect economic benefits, was ample to avoid any expenditure of tax revenue whatever. The same device, presumably in the form of a loan guaranteed by the Federal Government, offers a solution to the current project, with similar prospect of no expenditure of government funds. The necessary technology is at hand and tested in actual operation elsewhere. It is time for a decision and action, promotion of which is clearly within the province of the Commission.

Another matter of urgent governmental concern is the need for stimulation of the essential rail commuting service to Boston and that portion of New York's which serves Connecticut. Some expansion of service is desirable, but what is urgent is the vigorous upgrading and promotion of that part of the service, detailed in Chapter II, which is essential to preserving access to the cities. Failure to do so will greatly complicate the highway problem in the area where its solution is most difficult.

2. Needs Awaiting Future Development

Three possible future developments which might better serve the region's transportation needs or meet future needs deserve special mention.*

a. First in this category is the possible application of V/STOL aircraft to the region's transport. At present, the indications are that their cost is too great and their capacity too limited for general application, but this could change.

b. Second in this category is the possible limited revival of rail passenger service other than in the Boston-New York corridor. At the present state of the art, there is

*Another future development with possible New England interest is the movement of containers between the Orient and Europe by ocean carriage transferring to rail haul across North America. Further facility development as well as rate action on the part of the steamship companies is necessary, but once it is forthcoming, there will be great competition between both Pacific and Atlantic ports for this business, already evidenced by announcement of transcontinental rates by both ATSF-PC and UP-N&W. New England will wish to keep itself in the running.

no reason to prefer such service to the ubiquitous and self-supporting bus, but one new development could conceivably change this. The rail vehicle constructed by United Aircraft being tested between Boston and New York incorporates a new type of suspension said to enable it to negotiate curves at much higher speeds than conventional equipment. If so, it may prove feasible to operate high-speed and low-cost service on tracks maintained primarily for freight service. In this event, certain application of the new technology, outlined in Chapter II, might prove feasible and desirable.

c. The third in this category has to do with the development of new cities in America. Planners speak of the desirability of establishing new cities some 100 miles west of the northeast megalopolitan corridor linked to the metropolitan areas by high-speed transport. The application of ultra-high-speed rail technology to a commuting service 100 miles west of Boston, serving areas now rural or wilderness, would require heavy capital investment, and could probably only be undertaken by government.

3. Needs Requiring Continuous Review

It is desirable at this point to list those needs which require continuous review. Many of those already listed fall also into this category. Rail and air service and highway development are not static and require watching from the point of view of the public interest. It is especially important that such governmental attention be intermodal in concept to insure optimum resource allocation. Attention at the regional level is desirable to insure response to the region's needs. In addition to the obvious need for continuous policy review, the performance of many smaller functions by the Commission on a continuous basis would fill needs which would otherwise go unfilled. Small third-level airlines may need expert help from time to time. Short line railroads may be encouraged to operate branch lines unsupportable to Class I railroad standards. Shippers' associations may be fostered to take advantage of service not readily available to small shippers. Small bus and truck lines may be assisted to maintain essential service. The region's needs require frequent espousal before regulatory agencies. Both shippers and small carriers may frequently need a sort of ombudsman to help them find their way through the complexities of government procedure. It is recommended that the Commission establish an office of transportation to deal on a continuing basis with the matters herein discussed. They are summarized on the following page, so arranged as to indicate the relative urgency of action.

a. Needs of Immediate Urgency

(1) Ultra-High-Speed Rail Service Between Boston and New York

(2) Completion of Rail Merger Pattern

(3) Upgrading and Promotion of Essential Rail Commuter Service

b. Important Needs Not Now at Crisis Stage

(1) Highway Development - Urban Arterials and Interstate Connectors

(2) Regional Airline Concept with Third Level Feeder and Supplementary Service

(3) Lower Coal Rates and Expanded TOFC

c. Needs Awaiting Future Development

(1) V/STOL Aircraft

(2) Possible Revival of Rail Passenger Service

d. Needs Requiring Further Study

(1) North-South and East-West Highways

(2) 100-Mile Commuting

(3) Port of Boston Revival - Containership Facilities

e. Needs Requiring Continuous Review

(1) Expert Assistance to:

i. Third-Level Airlines
ii. Small Bus and Truck Lines
iii. Short Line Railroads
iv. Shippers' Associations

(2) Representation of Region's Interest before Regulatory Bodies

4. Impact on Other Social Values

Finally, it is desirable to call attention to a different sort of need, one often overlooked, but of great importance. This is the need to consider the impact of solution of transportation needs on other social values and observe the restraint imposed by proper evaluation of such costs. For example, when railroads were built, it was necessary to destroy some farmland. In hindsight, it appears to have been worth while in terms of the far greater value added to all

kinds of production, including farm produce. Highways, however, are far more voracious users of land, and it is not so clear that the value they add is in all cases commensurate. Air pollution provides another example. Small airports in many locations cannot be uncritically accepted and supported without careful consideration of their effect on other social values such as noise level, pollution, optimum land use, financial requirements of schools and hospitals, etc.

Such a need may also appear in reverse form. Unused facilities may be allowed by default to be absorbed for other use without consideration of their future usefulness as a result of change in need or technology. To guard against such a result of single-minded enthusiasm for the solution of a transportation need, proper analysis should be made of the impact on other social values. This consideration, of course, is a continuous need and an appropriate lasting concern of the New England Regional Commission.

It is equally important that governmental planning make use of transportation facilities to increase the availability of other government services and minimize their cost. By properly coordinating transportation with other planning, whatever level of health, education and welfare services of government are supportable at a given expenditure can be made available to more people. Conversely, a school or hospital can be equipped with better facilities if those facilities are made available to more people without unnecessary duplication. A familiar example is the area school, made available to more pupils by means of the school bus. The same principle can be extended to other services and to higher levels of concentration, but only if transportation planning is both intermodal and fully coordinated with the planning for the governmental activities which it can serve. This requires a shift of emphasis from mere construction of airports and highways to more imaginative concepts of changes in demand. Large sums for both transportation and other governmental services are being and will continue to be spent, but they will be misallocated if proper coordination is not achieved. Since the level of government expenditures in this region is \$0.5 billion per year for highways and an estimated \$0.2 billion for aviation, the importance of care in its allocation is obvious.

Chapter II

New England's Railroads

A. SUMMARY

The history of New England rail lines is that of a large number of small roads which proliferated rapidly and interconnected, showing strong affinity to the sea. The more recent disappearance of coastwise traffic and the opening of rail lines into the interior of the country changed their geography to that of terminating lines, except in Maine, whose roads are predominantly originating. Terminating lines have special problems caused primarily by the abnormal relationship of terminal costs to total expense. Merger with trunk lines is the most promising solution for these problems, as was demonstrated some time ago by the merger of the Boston and Albany into the New York Central. When the newly merged Penn Central takes the New Haven into its system, now expected not later than 1969, the region will benefit similarly and may hope to see the solution of the New Haven's terminating road's problem. The importance of the New Haven's freight service to the region is primarily that of carrying carloads of fuel, feed, foodstuffs, raw materials, building materials, manufacturing and a host of other commodities into the region from the rest of the country and distributing them to a multitude of individual consignees. To a smaller extent, the railroad provides the opposite service of gathering carload freight originating in the region, principally manufactured products, and despatching it to the rest of the country. The New Haven serves all the region's ports from Boston south and west.

The Boston and Maine, which performs a similar service to the New Haven, suffers from the same problem and requires a similar remedy. The B&M is competitive with the New Haven at most important Massachusetts points and serves some of Vermont, all of New Hampshire, and Maine as far as Portland, including the ports of Boston, Portland, and all those between. The current proposal of the N&W and C&O Railroads to merge contemplates taking the B&M into their system, along with other lines, with the result that the proposed system will cover all of Official Territory (generally east of the Mississippi and north of central Virginia) and be completely competitive with Penn Central. The New England Regional Commission should urge the ICC to approve the unification of these roads in order that the region may have the substantial benefits of two strong competing systems, each of which covers Official Territory.

Maine's railroads are geared to the economy of the state and reflect its extractive nature by the predominantly originating characteristics of their traffic. Connections with both major Canadian roads provide competitive outlets which enable the railroads of Maine to remain aloof from the U.S. merger movement.

The Canadian roads provide service to a portion of the region directly, and by their connections provide the whole region not only with service to and from Canada, but also to and from the western United States via Canada.

New England's Short Lines provide the very valuable service of making rail service available to portions of the region which would not otherwise enjoy it. The Leased Lines are so called because each is leased by a larger road. Until a lease terminates, such a road requires no special consideration, but upon such termination it may require technical assistance to enable it to resume independent operation or measure its value to alternative lessees.

The region's rail freight service will apparently provide the necessary support for growth provided the remaining merger is promptly put through. With Penn Central including the New Haven and N&W-C&O including the B&M there should be no question of the capacity of the region's rail network for needed freight service to 1980 and beyond. Special needs which are of proper governmental concern are the encouragement of trailer-on-flat-car (TOFC) service and reduction of coal rates, primarily by the greater use of unit trains. TOFC service will be more readily available to more shippers if it is made truly intermodal by encouragement of Plan V,* but this does not imply the discouragement of other plans. The importance of TOFC development lies not only in making its low-cost and high quality service available to small as well as trailer-load shippers, but also in relieving the per-mile cost of highway construction and maintenance. Lower coal rates are needed to lower power costs and to forestall what might turn out to be unfortunate commitments on the part of the power industry to nuclear generating plants.

Passenger service on New England's railroads has dwindled to the New Haven's service, Boston commuter service, and two trains on the Penn Central. Special needs exist for commuter service and for service between Boston and New York, both of which are discussed below. In the rest of the region there is no strong prospect for revival, unless tests soon to be made of the new suspension device on the United

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*TOFC plans are defined in Exhibits II-26 through II-30, inclusive, at the end of Chapter II, pp. 75-79.

Aircraft turbo-train proves satisfactory. If, as is promised, this device permits high-speed service on good freight track, then revival of rail passenger service in certain other parts of the region might be practicable.

Certain lines of Boston commuter service need to be retained and some extended. The possibility exists of future application of ultra-high-speed technology to commuter service as an experiment to test the effect on urban development of a practicable 100-mile daily commuter service from the core city. Some existing lines could with substantial expenditure be raised to standards necessary for such service. New York commuter service is necessary to Connecticut and needs retention by one of the plans developed by the various agencies concerned.

By far the most important need in rail passenger service is an ultra-high-speed Boston-New York service. This need is intermodal, since airway and highway capacity is so limited that serious congestion by 1980 is forecast. Current OHSGT* demonstration projects do not appear adequate at present to develop latent potential and more direct attack and drastic effort is needed. The brief survey of the improvements to the New Haven's Shore Line necessary to accomplish the desired result reported in Appendix B indicates that this may be accomplished by relocation of 37 miles, electrification from New Haven to Boston, and minor specific improvements. A by-product of such an improvement might be an international jetport at the mid-point serving both New York and Boston. The Commission should order further study and if the economic feasiblity is confirmed, the federal government should be requested to guarantee a loan for the purpose of undertaking the necessary expenditure. Alternatively the government might be asked to purchase the line, make the improvements and require user charges similar to those paid by airway and highway users.

B. HISTORICAL NOTES**

Compared to their development in other regions, railroads were built early in New England and proliferated. To a degree not well remembered today, their original location showed the strong influence of the sea on New England commerce and psychology. Most of the early lines connected interior points with a harbor or short cut the substantial impediment to coastwise traffic represented by Cape Cod.

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* Office of High Speed Ground Transportation, U.S. Department of Transportation.

** Map A-1, found on page 278, may be consulted to facilitate geographical reference while reading this chapter.

The first three lines, built within a year of each other, were put through in the early 1830's by Boston commercial interests after the failure of efforts to induce the Commonwealth of Massachusetts to build a rail network as a public work. Curiously, each of the three has become a part of one of the three railroads now serving Boston.

The Boston and Lowell, now part of the Boston and Maine, was built parallel to the Middlesex, one of New England's few canals, and soon superseded it by virtue of its lower cost and greater freedom from seasonal interruptions. Its unusual avoidance of intermediate towns (which afterwards grew toward it) and concentration on through traffic was prophetic of the future place of railroads in a more complex transportation system. It not only connected the new textile mills on the shore of the Merrimack with Boston, it also moved the traffic borne by that river in a connecting service which opened central New Hampshire to Boston's commercial and port interests, to the detriment of Newburyport.

The Boston and Worcester, now part of the Penn Central, early served Newton and Framingham, created the town of Wellesley, and opened the growing agriculture and manufacturing industries of Worcester to Boston. It enabled Boston successfully to compete with Providence for Worcester commerce, which the Rhode Island city had hoped to tap with the Blackstone Canal. The canal was never successful, and for the decade preceding the construction of the Providence and Worcester Railroad, the Boston and Worcester was Worcester's principal outlet. The Norwich and Worcester, opened in 1840, was more of a connection to than a rival of the B&W.

The Boston and Providence, the third of Boston's triplets, is now operated as part of the New Haven. It permitted Boston's coastwise seaborne traffic, including the considerable movement to and from New York, to avoid the circuity imposed by Cape Cod. This railroad, built by a very competent engineer named Whistler, father of the artist, was constructed to extremely high standards, remarkably free of curves, and almost wholly free of highway grade crossings. The famous Canton viaduct, built when railroad cars were stage coaches on flanged wheels, a century later carried at high speed steam locomotives weighing several hundred tons and still carries the largest diesels and the heaviest of freight cars. In the light of current problems it is fortunate that this exceedingly well-laid-out line of railroad is available to serve as part of an ultra-high-speed line between Boston and New York.

Hundreds of such small railroads were built, fortunately, and unlike those of some other regions, virtually all of standard gauge and linked together for the interchange of traffic. Their traffic was short-haul, generally of high-rated character, and strongly influenced by connection to seagoing carriers. Freight traffic was never dense to the degree experienced by railroads in other regions which enjoyed heavy volumes of coal, iron ore, steel, and similar commodities. Passenger traffic, however, was considerably heavier than that of the rest of the country and was responsible for a substantial portion of New England roads' profits.

The coastwise traffic which so strongly influenced the shape of the early New England rail network is gone, except for bulk commodities, and the other geographic influence has become dominant. The current major emphasis is the flow of traffic to and from the regions south and west and Canada. Such gradual shift of emphasis, together with the nearly complete takeover of intraregional traffic by highway transportation, has brought about some welding together of the lines into larger systems with a considerable orientation to interregional traffic. An extension of this same orientation provides the rationale for merger. A far more complete statement of the history and geography of New England railroads and their relation to the current merger movement is to be found in "Railroad Mergers and the Economy of New England," by James R. Nelson.*

C. PRESENT GEOGRAPHY

The changing developments and trends of history have left New England with a variety of railroads, different kinds of which can be discussed in separate groups. The New York Central (now part of the Penn Central) is in a group by itself because it is almost wholly outside New England, but its line into the region, the former Boston and Albany, forms an important link with the west and south. The New Haven (NH) and Boston and Maine (B&M) are the largest of the roads almost wholly intraregional, with many similarities, but some substantial differences. The two Class I roads of Maine, the Maine Central (MEC) and Bangor and Aroostook (BAR), are differentiated from the other New England roads by the different demands for freight movement made by the extractive rather than manufacturing economy of their state. The Central Vermont (CV), Grand Trunk (GT), and Canadian Pacific (CP) lines in Maine have in common the fact that they are Canadian-owned. New England's many short lines provide a service to the economy which would not otherwise be provided. Finally,

*The New England Economic Research Foundation, Boston, 1966.

there are a number of leased lines operated by the larger roads which become separately important only if their leases terminate. Map A-1, found on page 278, shows all New England railroads. Exhibit II-1 shows mileage by state and Exhibit II-2 shows the differing trends of freight traffic in different parts of the region.

D. FREIGHT SERVICE

1. Problems of Terminating Lines

Since New England is largely a manufacturing economy, importing its raw materials as well as its food and fuel from the west and south and exporting its products, the eastbound freight movements differ in character from the westbound. Because of the inward movement of food and fuel, and because the process of manufacture generally results in something smaller and lighter than the raw material from which it is made (and because some of the product is consumed locally), eastbound freight movement into New England is heavier in volume than that moving in the reverse direction. Because the demand for prompt and dependable movement of finished products is greater than for raw materials, and because manufactured goods of high value can bear higher rates, shift of finished products to truck in recent years has been disproportionate, with the result that the directional imbalance has been increased. This imbalance requires the movement of large numbers of empty freight cars westbound, a burden on New England railroads (other than those in Maine). See Exhibits II-3 and II-4. More important is the cost of freight car hire, which falls heavily on the New Haven and Boston and Maine as a result of the directional imbalance plus the way in which arrangements between railroads for interchange of freight cars work. Under these arrangements, roads whose traffic is predominantly terminating must accept cars belonging to other roads, switch them into proper order, move them to the consignee, await their unloading and return them to western connections empty. Since the rules require the predominantly originating roads of the west to own large car fleets and in effect forbid New England roads to own more than a very small number of cars, and since the rate of per diem payment for the cars is governed by a vote based on car ownership, the New England roads are helpless to avoid a crushing blow of car hire payments amounting to millions of dollars per year. This expense grows as freight cars become more costly. The western roads, who are the heavy car owners, contend that the New England roads, relieved by the rules of the burden of ownership, should be glad to pay rental covering the cost of the cars and, in addition, incentive payment to return the cars quickly. The argument

Exhibit II-1

MILES OF ROAD OPERATED-BY STATE
AND BY CLASS OF RAILROAD

Class I U.S. Lines	Total Miles[1]	Me.	N.H.	Vt.	Mass.	R.I.	Conn.
B & M	1,529	46	681	103	604	-	-
PC (B&A)	313	-	-	-	278	-	-
NH	1,555	-	-	-	605	146	675
BAR	544	544	-	-	-	-	-
MEC	921	839	60	22	-	-	-
Sub-Total		1429	741	125	1487	146	675
Canadian Lines							
CV	382	-	-	222	55	-	60
CP in Maine[2]	202	202	-	-	-	-	-
CP in Vt.	90	-	-	90	-	-	-
GT	164	84	39	41	-	-	-
Sub-Total		286	39	353	55	-	60
Total Class I		1715	780	478	1542	146	735
Total Class II		65	34	320	21	9	-
Total - Switching & Terminal Co.		5	13	-	10	1	-
Total All Railroads		1785	827	798	1573	156	735

1/ Total for all states served including N.Y. mileage of B&M, B&A,

2/ Includes CP in Maine, HB, and International Ry. Co.

Sources: BM 1966, NYC 1963, NH 1966, CV 1963, Annual Report to the Interstate Commerce Commission (Form A); CP in Vt., Northern Rails, Dwight A. Smith, Jr., Portland, Me., 1967; GT, MEC 1968, The Official Guide of the Railways, National Railway Publishing Co., N.Y.,N.Y., March 1968; All others, Interstate Commerce Commission Transport Statistics in the United States, Washington, D.C., 1966.

Note: Cf. Exhibit III-5a, page 93, for a comparison of railroad and highway mileage in each state, per 1,000 population and per square mile.

Exhibit II-2

TRENDS IN NEW ENGLAND RAIL FREIGHT TRAFFIC

	Tons of Revenue Freight (000)			Index of Tons of Revenue Freight 1950 = 100	
	1950	1962	1966	1962	1966
BAR	2,899.7	3,254.0	4,069.5	112	140
MEC	7,108.3	7,146.3	8,297.7	101	117
B&M	19,854.4	16,496.3	15,377.5	83	77
NH	24,235.1	18,801.2	19,904.7	78	82
Totals	54,097.5	45,697.8	47,649.4	84	88

Source: Arthur D. Little, Inc, and Edward S. Prentice, Freight Problems of New England Railroads, Office of the Under Secretary for Transportation, U.S. Department of Commerce, Washington, D.C., February, 1966, Exhibit I-1; ICC Transport Statistics, 1966, op. cit.

Exhibit II-3

NUMBER OF CARS TERMINATED OR ORIGINATED BY THE FIVE CLASS I 1/ NEW ENGLAND RAILROADS IN 1962

Railroad	Cars Handled				Ratio of Terminat To Origi nated Ca
	Terminated	Originated	Total	% of Total	
Bangor and Aroostook	47,515	82,803	130,318	9	1:1.7
Boston and Albany	83,121	31,527	114,648	8	2.6:1
Boston and Maine	289,857	119,699	409,556	29	2.4:1
Maine Central	79,883	81,145	161,028	11	1:1.1
New Haven	451,732	162,655	614,387	43	2.8:1
Totals	952,108	477,829	1,429,937	100	2.0:1

1/ Class I Railroads are defined by ICC as those with Gross Revenu in excess of $5,000,000 per year.

Source: Arthur D. Little, Inc., Freight Problems of New England Railroads, February 1966, Washington, D.C., Tables I-6, I-7.

Exhibit II-4

NUMBER OF CARS TERMINATED OR ORIGINATED IN EACH NEW ENGLAND STATE ON THE FIVE NEW ENGLAND CLASS I RAILROADS IN 1962

State	Terminated	Originated	Total	% of Total	Miles of Class I Railroad	Carloads Terminat & Origir per Mile Road (00
Me.	126,388	149,700	276,088	25.2	1,429	19.3
N.H.	38,645	14,089	52,734	4.6	741	7.1
Vt.	8,243	9,267	17,510	1.7	125	14.0
Mass.	392,490	130,218	522,708	47.5	1,488	35.1
R.I.	37,142	12,408	49,550	4.5	146	33.9
Conn.	134,511	47,374	181,885	16.5	735	24.7
Total	737,419	363,056	1,100,475	100.0	4,664	23.6

Sources: Exhibit II-1, ADL New England Railroad Study, op. cit., Exhibit I-5; SARC.

bogs down in the cost-accounting complexities of establishing the cost of ownership. Several students of the problem have pointed out that the solution lies in a national car pool,* but this is resisted by individualistic-minded railroad management. See Exhibits II-5 and II-6.

The geography of the New Haven and Boston and Maine, existing as they do as separate corporate entities at the end of the line, with only about 200 miles or less road haul and a highly complex requirement of classification and distribution, imposes a costly terminal operation on a weak revenue base. This disproportionate terminal cost, together with the car hire expense, has long been a financial burden to the major New England lines, becoming crippling in recent times. To some extent, it has been alleviated by the very high revenue divisions which New England roads have enjoyed, the long existence of which is evidence of the attractiveness of New England's traffic to the trunk lines south and west of the region, but of late it does not suffice. Road haul costs have more than kept pace with inflation by means of the greater productivity of modern equipment, but terminal costs have risen. The resulting increase in the terminal proportion of total costs has been especially burdensome to the predominantly terminating lines of New England. It is significant to note that these burdens are greatly increased, if not in fact created, by separate corporate ownership. The Boston and Albany division of the Penn Central has the same potential troubles, but since it is part of a vast system, with the full revenue of long haul to support its terminal costs, the problem is tremendously mitigated. Similarly, the portions of the Penn Central which are nearest the New York terminal area have all the same potential for trouble as does the CNJ,** but since the longer lines in effect absorb the financial problems, they avoid bankruptcy, unlike the CNJ and New Haven. Similarly, those portions of the western roads which serve the terminals of the Pacific coast face the same problems, but because they are parts of vast systems, the problems are readily surmounted. Clearly, the answer lies in mergers which will make the B&M and New Haven, like the B&A, part of large east-west systems, as almost all students of the problem have advocated. The weakness of the occasionally-heard proposal to merge all New England roads into one system is that it does nothing to alleviate these basic problems.

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* H.E. Bixler, "Who Should Own the Freight Cars," Modern Railroads, May, 1963.

** Central Railroad of New Jersey, currently in financial reorganization.

Exhibit II-5

COMPARISON OF FREIGHT CAR HIRE
(PER DIEM AND MILEAGE) BALANCE
FOR NEW ENGLAND RAILROADS
1966

(000)

	Credit Balance	Debit Balance
BAR	$ 2,608.5	--
MEC	--	$ 246.8
B & M	--	5,167.1
NH	--	9,639.2
Totals	$ 2,608.5	$15,053.1

SOURCE: ICC Transport Statistics, 1966, op. cit.

Exhibit II-6

COMPARISON OF FREIGHT CAR HIRE (PER DIEM AND MILEAGE) BALANCE OF THE TWO PROPOSED EASTERN RAILROAD SYSTEMS AND THE RATIO OF THE BALANCE TO FREIGHT REVENUE
1966
($000)

Penn Central	Car Hire (Debit)/Credit	Freight Revenue	Ratio of Car Hire to Freight Revenue
NYC	(41,767.4)	529,623.6	(.07886)
PRR	(66,437.4)	718,920.0	(.09241)
NH	(9,639.2)	66,280.7	(.14542)
AA	(872.3)	8,838.9	(.09865)
DT&I	(1,884.6)	26,221.0	(.07188)
LV	(4,641.2)	43,704.5	(.10618)
P&LE	17,545.1	31,512.8	.55675
N&W - C&O			
N&W	(12,434.8)	579,307.7	(.02146)
AC&Y	(54.0)	7,226.9	(.00747)
C&O	896.5	368,966.4	.00243
B&O	(39,376.4)	379,881.6	(.10365)
WM	4,368.3	48,214.0	.09059
B&M	(5,167.1)	52,142.1	(.09909)
D&H	937.0	40,352.7	.02322
EL	(16,854.4)	201,359.5	(.08370)
CNJ	(4,805.8)	40,365.0	(.11906)
RDG	(3,709.2)	89,787.5	(.04130)

NOTE: System totals not shown because internal debits and credits make such totals misleading.

Source: ICC Transport Statistics, 1966, op. cit.

2. Freight Rates

Curiously, these terminal problems and the high revenue divisions which attempt to meet them do not result in high freight rates for New England. The charge of high freight rates to and from New England is sometimes made, and such rates appear high because the freight hauled by New England roads is disproportionately weighted with high-rated commodities, but in fact they are not out of line with corresponding rates in other regions.† The penetrating analysis made by Dr. Nelson in his "Railroad Mergers and the Economy of New England"* shows that rail rates, low to begin with in contrast to other modes, have been progressively lowered, to the great benefit of New England. He goes on to show that the region has benefited more than other parts of the country from this progress, with the result that in general New England's interregional rates are among the lowest to be found. The great exception is coal. In recent times, the market competition which coal faces from other energy sources has brought about the use of now-famous unit trains, so reducing costs that rates have been cut sometimes in half.** Unit trains are loaded as a unit, remain coupled together throughout movement, are unloaded promptly by one consignee, and returned empty without switching. They have been used only sparingly in New England, and the result is, as Dr. Nelson also shows, that the favorable comparison of New England's rates with the rest of the country is reversed in the case of products of mines. (Exhibit II-7) Undoubtedly the sparse development of unit trains in New England is at least partly due to the separate existence of several railroads between the coal fields and New England. Establishment of both the operating and rate procedures involved in a unit train is much more difficult for an interline movement than a single line. Furthermore, the long-established liaison between coal-originating roads and the colliers which still ply the coastwise trade tends to divert the interest of those roads from energetically promoting the all-rail movement of coal. Clearly, again, the solution lies in mergers which will result in a road which serves both the coal fields and New England.

3. New Haven Freight Service

The result of historical and geographical trends is an arrangement of railroads in New England which can best be described by their points of connection with railroads to the west, usually referred to as the New England gateways.

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* Op. cit.

** The significance of this reduction is more fully discussed in section 13, page 48.

† cf. Appendix D, p. 301.

Exhibit II-7

INCREMENTAL REVENUES PER TON-MILE
SELECTED COMMODITY CLASSIFICATIONS, NEW ENGLAND VS.
UNITED STATES AND COMPARABLE HAULS, UNITED STATES

	Shipments to New England			
	Agriculture	Animals	Mines	Forests
To New England - miles	1110	1280	464	877
National average- "	450	881	239	555
Difference - "	660	399	225	322
Incremental revenue per ton-mile	1.12¢	2.89¢	1.16¢	0.80¢
Mileage block data:				
Block nearest to N.E. - Average - miles	1181	1193	469	787
Block nearest to national-Average - miles	482	824	314	496
Difference - miles	699	369	155	291
Revenue per ton:				
High mileage	$19.49	$33.88	$4.55	$12.91
Low "	9.59	23.07	3.64	9.92
Difference	$ 9.90	$10.81	$0.91	$ 2.99
Incremental revenue per ton-mile	1.42¢	2.93¢	0.58¢	1.03¢
Recapitulation: Incremental revenue per ton-mile				
New England Vs. U.S.	1.12¢	2.89¢	1.16¢	0.80¢
High vs. low U.S. mileage block	1.42¢	2.93¢	0.58¢	1.03¢

Source: Railroad Mergers and the Economy of New England, NEERF, James R. Nelson, Boston 1966, Table IV-5, p. 96

The most southerly of these is New York Harbor, the interchange point being referred to in railroad parlance as Harlem River. Proceeding northerly on the map, the others are Maybrook, Selkirk, Mechanicville, and White River Junction. All of these and movement of traffic through them are described in detail in Appendix A. The New Haven serves New York and Maybrook, the volume of the two together being larger than that of any other New England road's western gateways.

In addition to the freight moving through the two gateways which it serves directly, the New Haven also moves interregional freight which has entered New England (or will leave New England) by the Selkirk gateway of the Penn Central, described below. This freight the New Haven interchanges with the Penn Central at the interior junctions of Pittsfield, Westfield, Springfield, Worcester, or Framingham, whichever is nearer to the New England destination or origin. A glance at the map will reveal how the different lines of the New Haven form a complete set of feeder lines to and from the former New York Central to serve all of southern New England. According to the plans of the newly-merged Penn Central, when it takes over the New Haven substantially all of the interregional freight will move over these lines, flowing through the Selkirk gateway. The Erie-Lackawanna and the Reading-B&O-C&O group are understandably concerned over such de-emphasis of their connections with the New Haven, and resist strongly before the Interstate Commerce Commission and the courts. The solution offered by the N&W and C&O, as a condition of their merger, is to merge all the lines named above together with the D&H and B&M to form another trunk line entering New England through the Mechanicville gateway, served by the B&M. This unification would provide competitive service to the important common points of Boston, Lowell, Fitchburg, Worcester, Springfield, Holyoke, Northampton, and North Adams, but service to more southerly New England points would depend on connecting service of a competing line.

Connecting service similar to that with the Penn Central is maintained by the New Haven for interregional freight moving through the Mechanicville gateway over the B&M, connecting with the NH at the interior junctions of Springfield, Worcester, Fitchburg, and Lowell, thus establishing a precedent for such interline movement if merger of eastern railroads into two systems comes to pass.

The New Haven also handles a relatively small amount (some 10% of its volume) of overhead* freight between its two western gateways and interior junctions with the B&M.

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*"Overhead" freight is that received from one connection and delivered to another, neither originating nor terminating on the line in question.

According to the announced plans of the Penn Central, this freight would disappear entirely from the line of the New Haven, moving directly between the former New York Central line and the B&M.

Except for this small volume of overhead freight, the New Haven's business involves terminal movement with terminating business exceeding originating business by about three to one, producing all the burdens outlined above. Its revenue divisions, considered high by other roads, have not been sufficient, and the New Haven is currently in financial reorganization from which it can apparently only emerge by merger with a trunk line. The Shore Line from New York through New Haven, New London, and Providence to Boston is a water level route, except for one short grade between Providence and Boston, and is the short line between Boston and points south of New York in the important Middle Atlantic industrial area. This advantage, however, is offset by the necessity for float interchange in New York Harbor, involving high cost and delay. The Maybrook Line avoids the float interchange, but it is comparatively circuitous and suffers from severe grades. It joins the Shore Line at Devon, Connecticut, just west of New Haven. The important passenger service of the Shore Line, which will be described later, is something of an impediment to freight operations, but not much, since the demand for freight service requires operations of such trains largely at night.

The New Haven serves all of Connecticut, and is the only railroad serving that state except for the Central Vermont, whose line runs from the north through Willimantic to New London. The New Haven alone also serves all of Rhode Island, giving Providence the doubtful distinction of being the largest city in the United States served by only one railroad. Southwestern Massachusetts, including Cape Cod and the Fall River-Taunton-New Bedford area, is also exclusive New Haven territory. In addition the New Haven reaches several cities in central Massachusetts in competition with other roads, these cities including Boston, Framingham, Lowell, Fitchburg, Worcester, Springfield, and Pittsfield.

Apparently the New Haven's operations, long adapted to the Shore Line and Maybrook Line, will be entirely changed as a result of their inclusion in the Penn Central merged company. The importance of the two main lines will presumably diminish and those now considered branch lines will become the principal arteries. Such inclusion will produce the characteristic advantages of merger, e.g. concentration of traffic, with its economies of scale and reduction of classification, lessening the burden of the terminating carrier. The resulting route will shorten mileage to and from

the West, but increase it somewhat to and from the South, a small price to pay for the advantages. It is unfortunate that the Penn Central's line through the Berkshires is more circuitous and has stiffer grades than the competing line of the B&M, but the realistic view of today's merger picture clearly shows the two lines becoming the two principal routes connecting the region with the west and south. (See Map II-1, page 31.) It is interesting to speculate, although probably now too late to be of significance, that if transportation development had been coordinated between modes a few years ago, the rail map of New England might have been quite different. If, at the time the Verrazano Bridge was planned, arrangements had been made to include a rail right-of-way on it, the character of the New York gateway would have been completely changed and the Shore Line of the New Haven might well have become, once again, the major artery to the area south of New York, as well as a competitive line to the West.

4. Penn Central Freight Service

To return to present-day reality, however, as indicated above, the Selkirk gateway of Penn Central is apparently destined to become one of the two major gateways to New England and it has just been rebuilt into a major electronic classification yard. The Penn Central's line into New England extends from Selkirk to Pittsfield, Westfield, Springfield, Worcester, Framingham, and Boston with very few branches. The various lines of the New Haven, as indicated above, serve as branches of the Penn Central's line, and the majority of the Central's New England freight is interchanged with the New Haven at one of their junctions. There is no similar interchange volume between the former New York Central and the B&M at interior New England junctions, although they physically connect at four points, because the two roads have, by long-standing agreement, traditionally interchanged their freight at Rotterdam Junction, New York, the westernmost point on the B&M, near Schenectady.

5. B&M Freight Service

The B&M serves Mechanicville, New England's largest single gateway, with a line to the east through northern Massachusetts shorter and with considerably fewer grades than that of the Penn Central, which roughly parallels it in southern Massachusetts. The superior alignment of the B&M's route is the result of the building of the famous five-mile Hoosac Tunnel, constructed in 1873. The superiority of this route is best shown by the fact that a locomotive can haul about half again as much weight eastbound on this

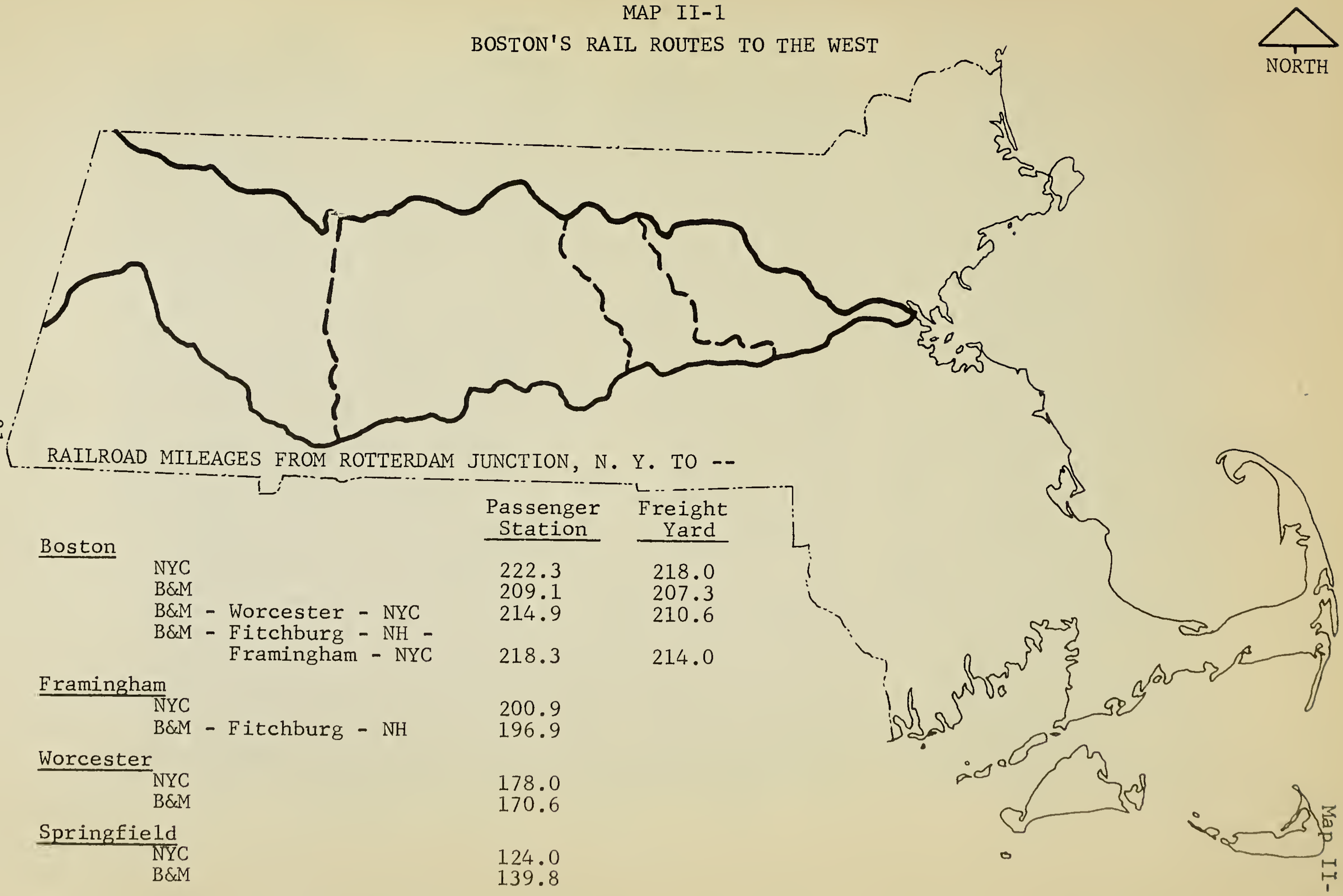
route as on the Penn Central.* The directness of the route shortens the distance from Rotterdam Junction to Boston by thirteen miles as compared with the Penn Central's single-haul line (see Map II-1). The existence of a competing line which is shorter and of lower grade is almost unique, since ordinarily railroad builders are willing to accept circuity primarily to obtain lower grades. This unique advantage has over the years resulted in the movement of a substantial amount of freight over the interline NYC-B&M route (fully half as much as over the single-line haul), surprising in view of the well-established ability of railroads to influence the movement of freight to their own long haul. The fact has been the foundation of the recommendation of several in the recent past that the merger movement be shaped in such a way as to bring the former New York Central and the B&M under the same management in order to combine the geographic advantage with the advantage of single-line management. This arrangement fitted the "two-system east" plan for rail mergers long advocated by some and outlined in the Penn Central case by the ICC staff. This plan involved the establishment of two ubiquitous and balanced eastern railroads by combining the Pennsylvania, Norfolk and Western, and New Haven on the one hand, and, on the other, the New York Central, C&O-B&O, and B&M, all other eastern roads being included in one or the other. With the consummation of Penn Central and its inclusion of the New Haven, the plan described above would appear to be a lost cause, and as a result the public interest of New England turns instead to the merger of the B&M with its other Mechanicville connection and the system growing up to the west of it. The Penn Central is now solidifying this second-best (though quite acceptable) pattern by building an elaborate electronic classification yard at Selkirk. Since Selkirk is some twenty miles east of Rotterdam Junction, the necessity for back haul obliterates the advantage of the more direct line of the B&M.

The B&M's line east from Mechanicville to Boston serves directly the important Massachusetts cities of North Adams, Greenfield, Gardner, and Fitchburg. By short branches, it also serves Northampton, Holyoke, Springfield, and Worcester. Its own lines, supplemented by several short lines, cover most of Vermont and New Hampshire, northeastern Massachusetts, including the northern part of the Boston metropolitan area, and western Maine as far as Portland, where it connects with the Maine Central. Thus the B&M is competitive with the

*It should be noted that the flexibility of modern diesel power reduces the importance of grades as compared with the days of steam.

MAP II-1

BOSTON'S RAIL ROUTES TO THE WEST



RAILROAD MILEAGES FROM ROTTERDAM JUNCTION, N. Y. TO --

	Passenger Station	Freight Yard
Boston		
NYC	222.3	218.0
B&M	209.1	207.3
B&M - Worcester - NYC	214.9	210.6
B&M - Fitchburg - NH - Framingham - NYC	218.3	214.0
Framingham		
NYC	200.9	
B&M - Fitchburg - NH	196.9	
Worcester		
NYC	178.0	
B&M	170.6	
Springfield		
NYC	124.0	
B&M	139.8	

New Haven and Penn Central in south central Massachusetts and has an exclusive territory to the north as the New Haven does to the south. Like the former New York Central, but to a much smaller extent, the B&M competes for interregional business in New Haven territory by use of interior junctions with that road at Springfield, Worcester, Fitchburg, and Lowell. The B&M also interchanges traffic with the New Haven at the same junctions for movement between B&M stations in northern New England and the regions to the south and west. This outline demonstrates the extreme complexity of the competitive routes between New England and the other regions of the country. Any trunk line can connect with any New England road either directly or by using another New England line as an intermediate, or both, producing a bewildering variety of routes and greatly complicating the already difficult problem of classification and train schedules.

The B&M's exclusive territory is less traffic-rich than the New Haven's, but this fact is balanced by the line's connection with the Maine Central, providing an opportunity to haul the very considerable traffic of New England's largest state. This traffic, furthermore, is especially desirable because it is overhead traffic whose uncomplicated haul, free of the problems of terminating traffic, is usually highly profitable and much sought-after by any railroad. In addition, the predominant direction of Maine's traffic is westbound, thus tending to offset the heavy eastbound balance of New England traffic in general. Many cars made empty on the B&M can be loaded in Maine, reducing the haul of empties and increasing freight car utilization.

In addition to Mechanicville, the B&M serves the White River Junction gateway, providing a route for the movement of freight between New England (other than Maine) and Canada, and for an even greater volume between New England and most of the United States via Canada. This route has for many years been very dear to the hearts of New England shippers because of the maintenance of what are referred to as the Canadian differential rates. Effective westbound only, these rates have traditionally been kept differentially lower than rates via United States lines to the same destination. In addition to a certain vagueness in times past about the power of the ICC to prevent lower rates via Canada, the circuity of movement and presumed longer time in transit have been the classic reasons for the rates. Curiously, the Canadian roads have in many periods operated their service so well that it has been competitive with the standard U.S. routes to many destinations, particularly Detroit and west. As a result of this service, useful both in itself and as a competitive threat to U.S. lines, any threat to the Cana-

dian differentials has always met with shocked resistance by New England shippers.

The B&M moves the White River Junction freight over two lines, one through central New Hampshire to Boston and the other the Connecticut River line to Springfield. By movement over the B&M's own lines, short lines, and the New Haven, western Maine and all of New Hampshire, Massachusetts, Connecticut, and Rhode Island are connected with Canada and the Canadian differential routes. Vermont is directly served by the Canadian-owned Central Vermont, described below, and Maine east of Portland is served by the two Maine roads, which have their own connections with Canadian lines.

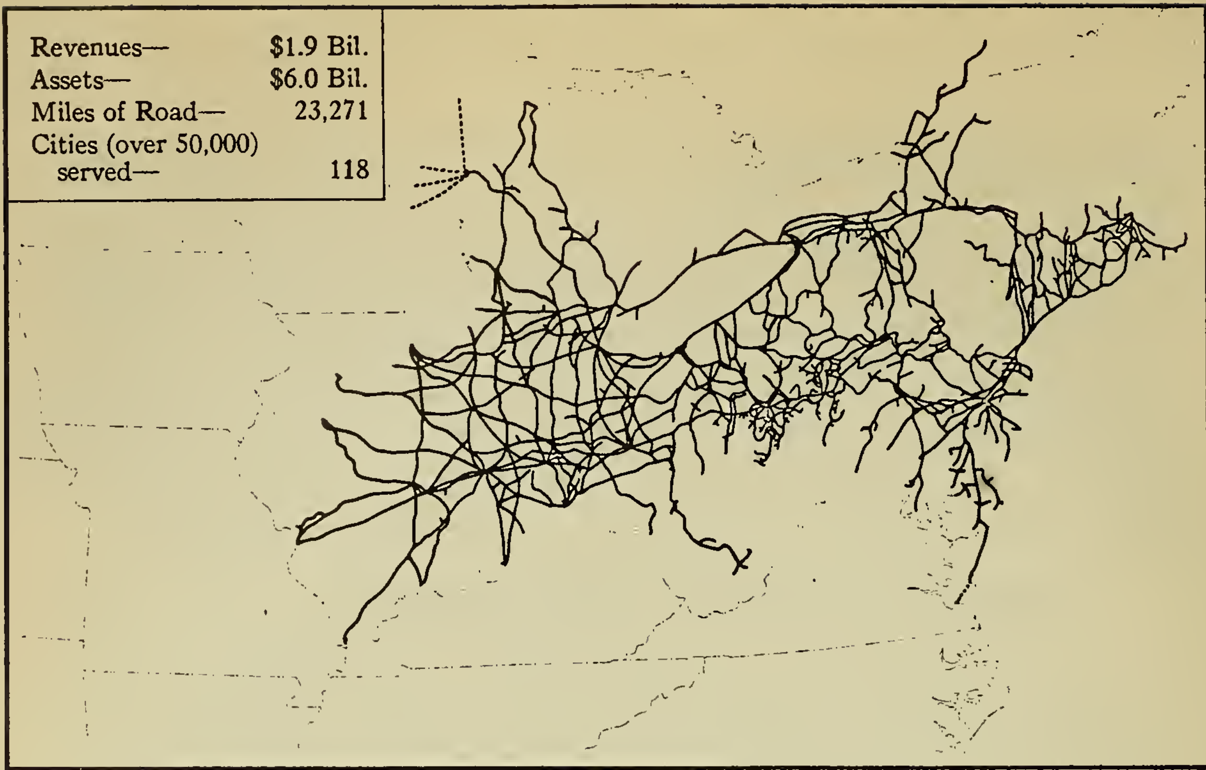
6. Importance to Region of N&W-C&O Merger

The geography of the New Haven, Penn Central, and B&M, just described, explains the interest of New Englanders, now the inclusion of the New Haven in Penn Central is an accomplished fact, in furthering the merger of the N&W and C&O, the resulting system to include the Reading, Jersey Central, Erie-Lackawanna, D&H, and B&M. Such a system would be the second of two strong roads serving New England, each of which would serve all of Official Territory.* (See Maps II-2 and II-3) The advantages of this arrangement lie partly in the fact that the resulting unification of lines permits the greatest practicable concentration of traffic without loss of competition.

The characteristics of railroad operation are such that concentration tends to produce substantial economies of scale, including heavier trains, reduction of intermediate switching, better equipment utilization from greater frequency, and more efficient maintenance, thus strengthening the ability of the remaining railroads to compete with other modes. Such intermodal competition benefits the public to the extent that it enables the railroads efficiently to move freight which would otherwise move by modes using publicly supplied facilities. With intramodal competition assured by the existence of two strong railroads, the public should be more certain of reaping the fruits of competitive endeavor than under the present circumstances. At present, although there are more railroads competing, they have long been protected by regulation from any real competition between themselves, and are too weak to carry on vigorous competition with other modes. The apparent competition between many roads which has characterized the past eighty years has not been real because the effect of regulation has been to protect the roads from each other's competition. Today, under

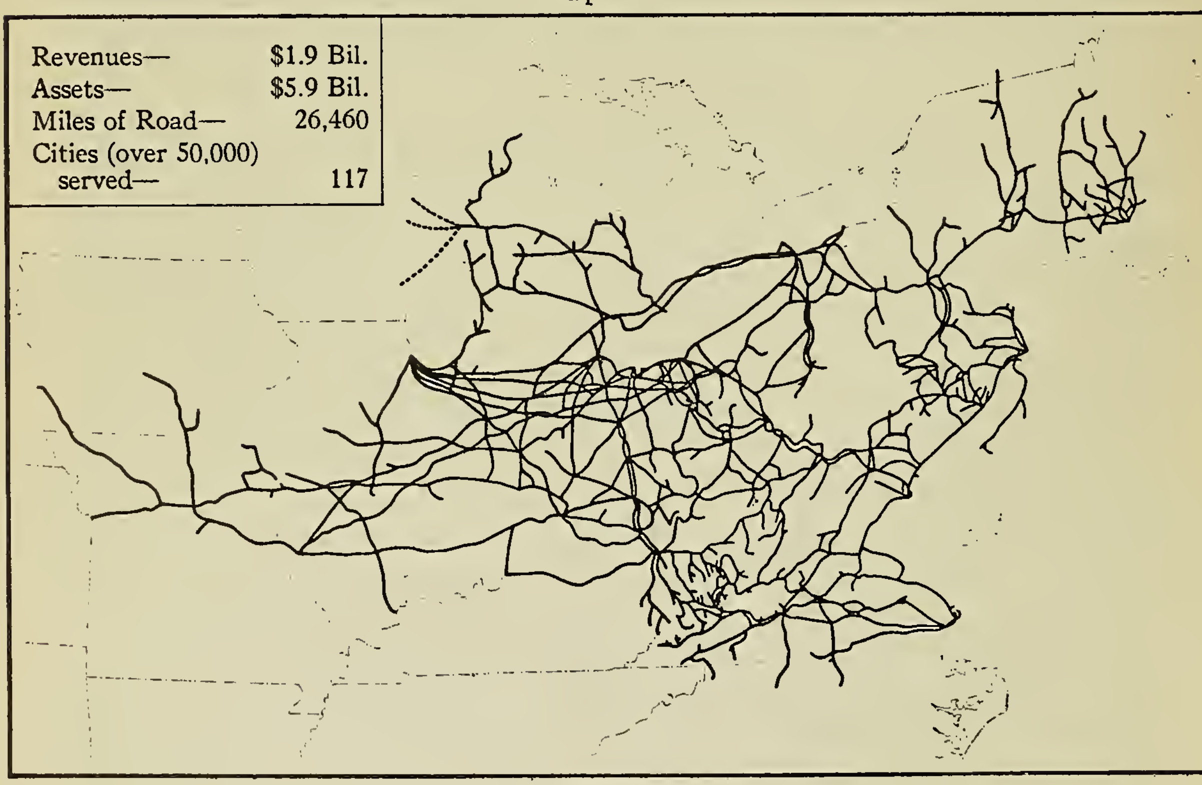
*Generally east of the Mississippi and north of a line running through Virginia to the Ohio.

Map II-2



PROPOSED PENN-CENTRAL SYSTEM

Map II-3



PROPOSED N&W-C&O SYSTEM

Source: Norfolk & Western Railway Company, Notice of Annual Meeting, 1966.

the stress of the competition of unregulated transport, regulatory policy is slowly recognizing that railroads are becoming more competitive, and this is both induced and exhibited by competition between themselves as well as with trucks and barges. This new competition, however, requires financial strength as well as single-management control over large areas, with the result that it is best exhibited by two large competing systems. Since the multiplicity of routes serving New England robs the roads (and the public) of the economies of concentration, the public loses today both in terms of competitive endeavor and economies. Today's newly burgeoning competitive strength in the railroad industry is being exhibited by the stronger roads. Hopefully, the merger movement will bring two strong roads to New England, and for the sake of these public benefits the region should strongly support the N&W-C&O merger.

This proposal is not to be confused with the so-called N&W inclusion case, which calls for the inclusion of the B&M (together with the D&H and E-L) in the N&W, but without the C&O, RDG, CNJ, and WM. This partial system does not satisfactorily cover the area, since it has no reasonably direct line between New England and the area of the Middle Atlantic States and south thereof, to and from which much of New England's freight moves. The N&W-C&O merger, on the other hand, does propose to include all of these roads in one system, providing full coverage. Unfortunately, from the standpoint of the improved services to be expected from unified management, the proposal calls for inclusion of five of the roads (one of which is the B&M) in a separate subsidiary called Dereco. Hopefully, this separation will be short-lived.

7. Maine's Railroads

The two Maine roads exhibit many differences from other New England roads. For one thing, they consistently make a respectable if not large profit. For another, they are primarily originating rather than terminating roads, cars loaded compared with cars unloaded running about four to three. The demand for empty cars which this ratio entails is met by calling on the B&M and even the New Haven, both of which are glad to supply them, both as a means of getting rid of the cars with their expensive per diem car hire and in order to use car supply as an inducement to route loads their way. Such inducement is important because traffic from the Maine roads can choose between direct connection with either Canadian road or the B&M at Portland. Once on the B&M, it can move to the B&M's gateway at Mechanicville (either to the D&H or continuing to Rotterdam Junction) or to the New Haven at Worcester. Once on the New Haven, the freight can be routed via any of the western connections at either Maybrook or the New York gateway.

Maine Central runs from Portland east through central and coastal Maine, with branches serving all freight producing areas, to Bangor, whence a coastal line continues to Calais and Eastport and an inland line to Vanceboro. At the last-named point, Maine Central connects with both Canadian roads to provide service between New England and the Maritime Provinces. Maine Central also runs through the White Mountains (where passenger trains in a past era provided the patrons with the best scenery east of the Rockies) to St. Johnsbury, Vermont, where it connects with the Canadian Pacific. A branch of this line runs north to Beecher Falls, Vermont, connecting with the Grand Trunk at North Stratford, New Hampshire. (Actually, for mutual convenience, interchange with the Grand Trunk takes place at Danville Junction, near Lewiston, Maine, but the physical existence of an interchange at an interior point as well as competition with the Canadian Pacific enables Maine Central to demand a higher revenue division). Thus Maine Central has its own connection to both Canadian roads, a connection which the Maine road cherishes both because the route thus provided gives Maine Central its longest haul and because the Canadian connections rescue the Maine road from what would otherwise be the dominance of the B&M, the only other outlet to the rest of the nation available to Maine Central. The affinity of Maine to Canada which geography suggests is cemented by rail traffic and connections.

The same is true of the Bangor and Aroostook, Maine's other Class I railroad. It runs generally north and south, connecting with Maine Central at Northern Maine Junction, near Bangor, with the Canadian Pacific at Brownville Junction, about forty-five miles north, and with the Canadian National at the north end of its line at the international border between Van Buren, Maine and St. Leonard, P.Q. It also runs south from Northern Maine Junction to Searsport, where it maintains port facilities handling bulk cargo originating on its lines as well as imports, thus avoiding entire dependence on rail connections (Exhibit II-8).

The Maine roads' strong ties with Canadian roads, coupled with the earning power which the Maine roads consistently exhibit, enable them to remain aloof from the merger struggle. No matter what eastern system finally includes the B&M, the Maine roads can deal with it from strength by virtue of alternate outlets to both of the two strong Canadian systems. If the B&M becomes stronger from merger, so much the better for the Maine roads, and they need not be unduly concerned. From the standpoint of public need, a similar insouciance is justified. Apparently the Maine roads are providing Maine's industry with a high

Exhibit II-8

ESTIMATE OF PROPORTION OF
BANGOR & AROOSTOOK RAILROAD
TRAFFIC MOVING VIA VARIOUS GATEWAYS

Gateway	Forwarded	Received
Mechanicville	30%	15%
Harlem River	25%	21%
Rotterdam Junction	12%	18%
Maybrook	4%	6%
All Others	29%	40%
Total	100%	100%

Source: ADL, New England Railroad study, op. cit; Railroad Records

standard of transportation of the kind to which rail technology is well adapted. Maine's industry, sometimes characterized by the alliterative phrase "paper, pulp, and potatoes," requires a smooth flow of large volume at low cost. There is, of course, a great deal more to Maine industry than the "three P's," but they loom large in the state's economy and make relatively heavy transportation demands.

One exception to the lack of interest of Maine roads in U.S. rail mergers is that the Maine roads do suffer from the divided responsibility of management of the many lines in Official Territory. One of the important advantages of end-to-end rail merger is that it permits uniform managerial policy over the entire route of movement of more of the freight, both in service and rate matters. In the movement of potatoes, for example, the Maine roads are hampered in their freedom to establish rates by the necessity for joint action with several managements. This necessity is particularly troublesome in that any truck which hauls anything into Maine may bargain for a truckload of potatoes on its return trip completely free of any regulation by virtue of the agricultural exemption. The problem thus presented is, of course, national rather than regional, but it is an interesting example of the effect of uneven regulation. Theoretically, the unevenness of the regulation could be removed by cancelling the agricultural exemption, but the evidence clearly indicates that this would make matters worse. Dr. James C. Nelson found in his "The Effects of Entry Control in Surface Transport"* that the unregulated portion of the trucking industry was characterized, unlike the regulated portion, by small firms, strong competition, low rates, and satisfactory service. Clearly, the remedy is to extend the exemption to rail and other modes. The point to be made, here, however, is that if the Maine roads had such freedom they would be hampered in its use by multiplicity of individual management. Merger would make it easier, even if they were not included in the new system, since they would (assuming the new system served all of Official Territory) be able to deal with only one connection.

It must also be acknowledged that the Maine roads are somewhat vulnerable to Plan V TOFC.** This is the plan by which railroads join with highway carriers for the through movement of trailers part way by highway and part way by rail. A strong railroad terminating in Portland could make

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* Included in "Transportation Economics," Columbia University Press, November, 1965.

**TOFC plans are explained in Exhibits II-26 through II-30 inclusive, at the end of Chapter II, pages 75-79.

Plan V arrangements with a highway carrier for connecting service to all of Maine. This ever-present possibility tends to balance the opportunity of the Maine roads to play their Canadian connections against a United States road. Even if, however, Plan V movement, encouraged as advocated herein, grows substantially, the public benefits of such movement would outweigh the disadvantage to Maine railroads, particularly since Plan V would move principally small shipments.

8. Other Merger Proposals

Another merger which is sometimes proposed is that of the Maine roads and the B&M. One difficulty with this proposal is the disparity in financial size. The B&M is a burden more easily assumed by, say, the Norfolk and Western than by the stalwart but small roads of Maine. Equally important, the New England railroad merger stops at the Hudson River gateway and must there interchange traffic with trunk lines which may have other New England interests. Even adding the D&H, as has also been proposed, only pushes the frontier to Binghamton or Wilkes-Barre, far from the desideratum of complete Official Territory coverage.

One merger for the Maine roads which would appear to be clearly in the public interest is their combination into one road. This would allow a single management concerned with virtually all of Maine's traffic to bargain with, hopefully, one strong eastern road, with the two Canadian roads as alternatives. Such bargaining power and simplification of management relations would tend to increase the resulting single Maine road's ability to arrange lower cost-based rates and faster interline service.

9. Canadian Roads

The Canadian roads in New England form an important part of the rail network. As should be clear from the foregoing, they provide an outlet not only to Canada but via Canada to central and western states, with the added attraction of a westbound rate differentially lower than that of standard lines. They also rescue the Maine lines from the possible domination of a single U.S. outlet. In addition, they provide the support necessary to keep one small New England carrier, the Central Vermont, alive to serve a large part of Vermont and small sections of Massachusetts and Connecticut. In return, the Canadian lines have access to New England's and New York City's traffic and to the region's ports. The Canadian National, perhaps because it is a government corporation, uses the names of subsidiaries wherever it enters the United States--in New England, the Central Vermont and the Grand Trunk. The Canadian Pacific operates under its own name, entering New England at two points.

The CPR's line from Montreal to St. John, New Brunswick, cuts across Maine for obvious geographic reasons from Megantic, P.Q., through Jackman, Maine, to Vanceboro where it enters New Brunswick. This line crosses the Bangor and Aroostook at Brownville Junction, providing that line with its valuable CPR connection. From Mattawamkeag to Vanceboro, the CPR has trackage rights over a portion of the Maine Central called the European and North American Railroad. This interesting name discloses the original purpose of the line--to carry passengers and freight from New York and New England to Halifax for steamer connection--thus saving a day in the transatlantic journey. Its only recent use for that purpose was for troop movements in World War II and one later brief use during a strike at the Port of New York. Continuing from Vanceboro, the CPR forms a connection between the Maine Central and the Maritime Provinces. By trackage rights the CNR uses the CPR's track east from Vanceboro, thus forming a similar connection to the Maine Central. Short branches of the CPR cross Maine's eastern border to serve Houlton and Fort Fairfield. The CPR's short line subsidiary, the Aroostook Valley Railroad, extends this service to Presque Isle, Sweden, and Caribou.

The other major CPR line in New England enters Vermont at Newport and continues through St. Johnsbury to Wells River, where it connects with the B&M. En route this line of the CPR connects with the Maine Central at St. Johnsbury, thus providing that road with one of its two valuable Canadian outlets.

The Grand Trunk provides the other. One of the early New England roads, intended to open the continent to the port of Portland, the line runs northwest from that city across New Hampshire and the northeast corner of Vermont to enter Quebec at Coaticook, where it becomes the CNR and continues to Montreal and beyond. As explained in the discussion of Maine Central, connection is made between that Maine road and the Grand Trunk at North Stratford, New Hampshire, the nominal tariff interchange point, but cars are actually interchanged at Danville Junction, Maine.

The Central Vermont, a subsidiary company of Canadian National, enters Vermont at East Alburgh, runs south through St. Albans to Essex Junction (near Burlington, which it serves by means of a short branch), cuts east to Montpelier Junction, and continues to White River Junction, the gateway through which most of its interchange with the B&M is performed. The CV continues south along the Connecticut River, sharing tracks with the B&M, to East Northfield, Massachusetts, where the two roads diverge. The CV crosses the B&M's main line west at Millers Falls, the Penn Central at Palmer, and continues into Connecticut, where it inter-

changes with the New Haven at Willimantic and New London, the end of its line. For many years, the Central Vermont ran steamer service between New London and New York, but it now relies for New York traffic on the rail connection of the New Haven. It is clear that the portion of the CV north and west of White River Junction is of substantial importance to the region's economy, as one of two gateways to Canada, as a competing gateway to western states, and as the only means of rail service to a substantial portion of Vermont. South of White River Junction, the road is less essential since that gateway can be reached from virtually all of New England by the New Haven and B&M, but it is by no means without value. If, as is to be hoped, New England's two largest lines are each to be merged into one of two large eastern railroads, there will be areas which each of the two serves exclusively, and the existence of an independent line cutting across both portions of the region may well serve to induce more interline competition and cooperation.

Thus the Canadian lines are important to New England in a number of ways. To the extent that they are problem children, they are the problem of the Canadian taxpayers rather than those of the U.S. This is a comforting thought, but more important is the apparent probability that New England's freight traffic will be sufficiently attractive to the Canadian roads to preserve their service so long as they are not hampered by restrictions, regulation, or unduly severe taxes. One regulation which is unique to the Canadian roads works quite unintentionally to their advantage. Customs regulations permit Canadian-owned freight cars (as distinguished from their contents) to enter the United States free of duty so long as they are not reloaded here except to, through, or in the direction of Canada. This means that any Canadian cars which find their way to, for example, a Maine paper mill, can only be routed via one of the Canadian lines. The unintended result of this protective tariff is to deny U.S. roads a chance at the traffic, but it is a relatively minor nuisance. Clearly, it is to the region's advantage to continue to make the Canadian roads welcome.

10. Short Lines and Leased Lines

The next group of railroads in New England to be described consists of the short lines. There is no precise definition of a short line. Generally speaking it is an independent line whose length may vary from one or two to 150 miles, but there is no arbitrary size limit. Short lines are not Class I railroads as defined by the ICC (total

revenue \$5 million or more), but Class II railroads are not necessarily classified as short lines. Generally, short lines have working agreements with labor which have less rigid definitions of division of labor than standard rail labor agreements, but this is more a result than a cause and therefore not useful as a definition. It is, however, in many cases the reason for the existence of the line because without such advantages the line would not be economically viable.

For the purposes of this report, the definition of short lines in New England will be all roads which have not been described above, excepting the leased lines separately listed. (Leased lines might become short lines upon termination of their lease.) All of the short lines and leased lines of New England are listed and described in Appendix A.

11. Region's Rail Freight Service*

From the foregoing description and the map it will be seen that the freight service provided the region by its railroads consists mainly of interregional movement to and from the rest of the United States and Canada, the distribution and collection of such freight within the region, and to a lesser extent, an intraregional movement (Exhibit II-9). Comparative volumes to and from other regions are shown in Exhibits II-10, II-11, and II-12. Less-than-carload service is no longer provided, but freight forwarders offer such service between the New England cities of Boston, Providence, Worcester, Springfield, Hartford, and New Haven and other major U.S. cities. The railroads provide an extensive trailer-on-flat-car (TOFC) and container service and REA Express provides a package service which involves rail haul to some extent. As Map A-2, p. 279, indicates, the lines into the region are the most heavily traveled, together with those connecting such lines with major cities and with Maine. The smaller branch lines are under attack by those who believe such lines represent a drain on rail resources, but such belief is not necessarily well-founded. As long as a railroad performs conventional rail carload service, it does not help solve basic problems of resource allocation to talk about abandonment of a branch line on the basis of full cost allocation. The only true test is whether the revenue from the traffic on the branch line exceeds the savings in cost which could be made if the

*More detailed description will be found in "The New England Railroads," by Martin L. Lindahl, New England Economic Research Foundation, Boston, 1965.

Exhibit II-9

FREIGHT TRAFFIC TERMINATED OR ORIGINATED BY SOUTHERN NEW ENGLAND RAILROADS CLASSIFIED AS INTERREGIONAL OR INTRAREGIONAL LOCAL TRAFFIC - 1962*

	New Haven			Boston & Maine			Boston & Albany			Total		
	Cars	%	%	Cars	%	%	Cars	%	%	Cars	%	%
Interregional												
Terminated	341,800	79		214,818	78		79,553	73		636,171	78	
Originated	89,532	21		60,759	22		29,863	27		180,154	22	
Total	431,332	100	82	275,577	100	77	109,416	100	95	816,325	100	82
Intraregional												
Terminated	22,517	78		23,288	52		1,885	53		47,690	62	
Originated	6,269	22		21,418	48		1,675	47		29,362	38	
Total	28,786	100	6	44,706	100	11	3,560	100	3	77,052	100	7
Local (on one railroad)	63,055	100	12	42,962	100	12	1,672	100	2	107,689	100	11
Total	523,173		100	363,245		100	114,648		100	1,001,066		100

Source: Railroad Records, Freight Problems of New England Railroads, Arthur D. Little, Inc., Cambridge, Massachusetts, February 1966, p. 126.

* Later data is unavailable, but these figures are believed to represent reliable relative values.

Exhibit II-9

Exhibit II-10

RAIL TERMINATIONS IN NEW ENGLAND BY REGION OF ORIGINATION
1949 and 1960

Region of Origination	Manufactures and Miscellaneous		Products of Mines		Products of Agriculture		Products of Forests		Animals and Products		Forwarder Traffic		Total All Commodities	
Totals - Tons 1949*	14,496,900		10,960,300		3,692,900		2,517,800		1,227,900		--		32,895,800	
Totals - Tons 1960*	13,994,300		8,043,300		2,877,400		2,442,100		1,062,800		69,300		28,489,200	
Per Cent of Total 1949	44.07%		33.32%		11.23%		7.65%		3.73%		--		100.00%	
Per Cent of Total 1960	49.12%		28.23%		10.10%		8.57%		3.73%		0.25%		100.00%	
Per Cent of Product Group Originating In:	1949	1960	1949	1960	1949	1960	1949	1960	1949	1960	1949	1960	1949	1960
New England	28.50%	29.26%	26.25%	22.41%	15.21%	10.07%	63.01%	64.79%	6.98%	2.57%		2.88%	28.10%	27.38%
Middle Atlantic	43.18	34.53	56.89	43.23	31.16	27.88	5.65	2.43	12.10	3.36		9.96	42.36	32.34
East North Central	14.50	15.36	1.61	3.17	19.93	28.44	1.18	1.34	28.89	21.96		78.21	10.33	12.43
South Atlantic	7.28	10.23	14.90	30.36	8.48	5.81	12.10	5.45	2.86	2.97		--	10.16	14.76
West North Central	1.76	1.65	0.10	0.16	10.51	7.52	1.81	1.33	38.67	57.36		8.95	3.57	3.89
East South Central	1.27	2.96	0.08	0.15	2.33	1.30	2.45	1.97	1.77	2.98		--	1.10	1.91
West South Central	1.45	2.64	--	0.10	2.48	3.49	1.26	0.96	3.22	0.96		--	1.14	1.80
Mountain	0.57	0.75	0.06	0.22	1.69	2.88	1.01	2.86	3.81	3.59		--	0.68	1.10
Pacific	1.49	2.62	0.11	0.20	8.21	12.61	11.53	18.87	1.70	4.25		--	2.56	4.39
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Tons inflated from one per cent sample.

Source: I.C.C.: Carload Waybill Analyses, 1949 and Carload Waybill Statistics 1960. The estimates for 1949 were taken from the Committee of New England: Origins and Destinations of New England's Rail Traffic, 1949 (Staff Memorandum No. 1), March, 1952.

Reproduced from Lindahl, New England Railroads, New England Economic Research Foundation, Boston, 1965.

Exhibit II-10

Exhibit II-11

RAIL ORIGINATIONS IN NEW ENGLAND, BY
REGION OF TERMINATION, 1949 and 1960

Region of Termination	Manufactures and Miscellaneous		Products of Mines		Products of Agriculture		Products of Forests		Animals and Products		Forwarder Traffic		Total All Commodities	
Totals - Tons 1949*	8,754,200		3,541,100		1,654,600		2,166,500		230,700		--		16,347,100	
Totals - Tons 1960*	4,441,400		2,301,300		897,000		1,821,600		92,500		204,700		13,758,500	
Per Cent of Total 1949	53.55		21.66		10.12		13.26		1.41		--		100.00	
Per Cent of Total 1960	61.35		16.73		6.52		13.24		0.67		1.49		100.00	
Per Cent of Product Group Terminating In:	1949	1960	1949	1960	1949	1960	1949	1960	1949	1960	1949	1960	1949	1960
New England	47.20%	48.51%	81.26%	78.31%	33.94%	32.32%	73.23%	86.85%	37.15%	29.51%		0.98%	56.55%	56.68%
Middle Atlantic	26.52	24.22	12.53	18.09	49.72	47.89	22.38	8.33	44.04	49.84		7.18	25.53	22.55
East North Central	13.27	14.41	3.52	2.41	6.47	7.63	2.50	2.99	10.23	7.35		81.73	9.00	11.40
South Atlantic	6.27	5.12	0.75	0.30	8.38	10.92	0.34	0.67	3.25	10.06		1.61	4.46	4.09
West North Central	1.88	1.95	0.83	0.52	0.26	--	0.86	0.15	1.65	--		5.71	1.35	1.39
East South Central	1.16	1.62	0.24	--	0.67	0.84	0.22	0.17	2.30	--		0.98	0.81	1.08
West South Central	1.70	1.03	0.38	--	0.29	0.22	--	--	--	--		--	1.02	0.64
Mountain	0.27	0.23	--	--	--	--	0.11	0.27	0.99	--		--	0.17	0.18
Pacific	1.73	2.91	0.49	0.37	0.27	0.18	0.36	0.57	0.39	3.24		1.81	1.11	1.99
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00		100.00	100.00	100.00

*Tons inflated from one per cent sample.

Source: I.C.C.: Carload Waybill Analyses, 1949 and Carload Waybill Statistics, 1960. The estimates for 1949 were taken from the Committee of New England: Origins and Destinations of New England's Rail Traffic, 1949 (Staff Memorandum No. 1) March, 1952

Reproduced from Lindahl, New England Railroads, New England Economic Research Foundation, Boston, 1965.

Exhibit II-12

RAIL "EXPORTS" FROM NEW ENGLAND TO OTHER REGIONS, 1949 and 1960
(Originations in New England which terminated outside the Region)

Region of Termination	Manufactures and Miscellaneous		Products of Mines		Products of Agriculture		Products of Forests		Animals and Products		Forwarder Traffic		Total All Commodities	
Totals - Tons 1949*	4,622,000		663,700		1,093,000		580,000		145,000		--		7,103,700	
Totals - Tons 1960*	4,346,100		499,100		607,100		239,500		65,200		202,700		5,959,700	
Per Cent of Total 1949	65.06		9.34		15.39		8.17		2.04		--		100.00	
Per Cent of Total 1960	72.93		8.37		10.19		4.02		1.09		3.40		100.00	
Per Cent of Product Group Shipped To:	1949	1960	1949	1960	1949	1960	1949	1960	1949	1960	1949	1960	1949	1960
Middle Atlantic	50.22%	47.03%	66.82%	83.41%	75.26%	70.76%	83.59%	63.38%	70.07%	70.71%		7.25%	58.75%	52.06%
East North Central	25.13	27.99	18.79	11.10	9.80	11.27	9.34	22.72	16.28	10.43		82.54	20.71	26.32
South Atlantic	11.88	9.95	4.02	1.38	12.69	16.14	1.26	5.09	5.17	14.26		1.63	10.26	9.43
West North Central	3.57	3.79	4.42	2.39	0.38	--	3.22	1.13	2.62	--		5.77	3.11	3.21
East South Central	2.20	3.14	1.28	--	1.02	1.24	0.83	1.25	3.65	--		0.99	1.85	2.50
West South Central	3.22	1.99	2.03	--	0.44	0.33	--	--	--	--		--	2.36	1.49
Mountain	0.51	0.45	--	--	--	--	0.43	2.09	1.59	--		--	0.40	0.41
Pacific	3.27	5.66	2.64	1.72	0.41	0.26	1.33	4.34	0.62	4.60		1.82	2.56	4.58
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00		100.00	100.00	100.00

*Tons inflated from one per cent sample.

Source: I.C.C.: Carload Waybill Analyses, 1949 and Carload Waybill Statistics, 1960. The estimated for 1949 were taken from the Committee of New England: Origins and Destinations of New England's Rail Traffic, 1949 (Staff Memorandum No. 1), March, 1952.

Reproduced from Lindhal, op. cit.

Exhibit II-12

line were abandoned. On this basis many of the region's branch lines, of substantial importance to the industries located on them, will continue to serve the public for some time.

The effect of the inclusion of the New Haven in Penn Central will apparently be to lessen materially the freight volume on the Shore Line and Maybrook Line, greatly increasing it on the former New York Central and the New Haven branches which connect with it. Maine's importance as a traffic producer is also indicated on the map. This traffic is predominantly westbound, whereas in New England in general the balance is heavily eastbound.

Highway carriers have largely taken over the movement of small shipments and most of the short-haul traffic, as well as competing with the rails for long haul. In general, railroads haul into the region raw materials for manufacturing, fuel, building supplies, food, automobiles, appliances, and other supplies in large volume. For the most part, manufacturers depend on railroads more for inbound movement of raw materials than the outbound movement of finished products, but there are exceptions (e.g., paper, wood products, building materials, machinery). The inbound movement may surely be deemed essential in the sense that its cessation would quickly cause food and fuel shortages and shut down some manufacturing. There is very grave doubt that any other mode could replace this service. Outbound service does not meet such a definition of essentiality, but the fact that it carries a quarter of the region's exports indicates its importance to the economy.

In spite of the truck's inroads on the transportation of manufactured products, the region's railroads are by no means merely heavy haulers. In addition to the small shipment service offered by rail freight forwarders at major points, TOFC service is rapidly growing,* as it is in the rest of the country, and for interregional hauls it offers generally lower rates and at least comparable service with the highway competition. This is the finding of a study of intermodal freight transportation by Merrill J. Roberts and Associates, Inc., University of Pittsburgh, for the U.S. Department of Commerce in 1933. TOFC service is available for truck load lots, but small shippers must band together in cooperatives to avail themselves of it. Several such organizations have sprung up, but the furthering of more cooperative TOFC arrangements between highway and rail carriers would make the advantages available to more shippers. The University of Pittsburgh study funds that "Prog-

*Exhibits II-26 through II-30 inclusive, at the end of Chapter II, pages 75-79, contain data concerning TOFC service.

ress is impeded . . . by adverse management attitudes, particularly where competitive relationships dampen cooperative propensities."

The nation's railroads have declined in terms of their share of freight traffic in recent years from overwhelming dominance to some 43%, but the decline appears to have been halted and may even have been reversed. They still haul substantially more freight traffic than any other mode. (Exhibit II-13)

12. Need for Encouragement of TOFC

Any action which can encourage further cooperation and the faster growth of TOFC will be beneficial in several ways. The smaller shipper who does not belong to a cooperative will benefit from lower cost. Highway congestion will be relieved and both maintenance and construction costs of new highways will be lessened. Existing rail facilities will be better utilized. In both Great Britain and Germany proposals have been announced that would force long distance and heavy bulk truck hauls to rail lines as a means of optimizing the use of resources. Undoubtedly so drastic a measure is politically unthinkable here, but any persuasion or encouraging action would produce the same benefits, albeit in lesser degree. The design of such persuasive action, perhaps by adjustment of user charges, together with its economic effects, would form a useful subject of further study by the Commission.

13. Need For Coal Rate Reduction - Unit Trains

Another failing of the region's railroads is the unusually high coal rates which New England pays, as developed in Dr. Nelson's study referred to earlier. Not only are standard coal rates high, but unit trains have been introduced only to a limited extent. This has economic consequences more far-reaching than even the effect on fuel cost. New England's power companies have announced plans for the development of atomic energy plants. Meanwhile, a recent study* indicates that coal in many circumstances represents cheaper fuel for power generation than atomic energy, provided it is moved in unit trains at cost-based rates. Exhibit II-14 shows the results of a recent study indicating that the breakeven coal cost of nuclear power plants is higher than present achievable coal cost for some years to come. Possible further reductions in coal cost are not calculated. If, then, the

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*"Future Market for Utility Coal in New England" (See Exhibits II-14 and II-15) prepared by Arthur D. Little, Inc., for the U.S. Department of the Interior, 1966.

Exhibit II-13

COMPARISON OF INTERCITY CARGO TON-MILES BY MODE
1959-1966
(millions)

Year	Railway revenue ton-miles, including electric railways express and mail	Motor Vehicles	Inland waterways, including Great Lakes	Pipelines (oil)	Airways (domestic revenue service) including express mail and excess baggage	Total
1959	582,497	278,934	196,559	226,991	739	1,285,72
1960	579,130	285,483	220,253	228,626	778	1,314,27
1961	569,997	296,485	209,706	233,172	895	1,310,25
1962	599,977	309,407	223,089	237,723	1,289	1,371,48
1963	629,337	336,170	234,172	253,431	1,296	1,454,40
1964	666,207	356,298	250,165	268,655	1,504	1,542,82
1965	708,700	359,218	262,421	306,393	1,910	1,638,64
1966	750,762	380,917	265,000	332,916	2,252	1,731,84
			Percentages of annual total			
1959	45.31	21.70	15.29	17.65	0.0575	100.0
1960	44.06	21.72	16.76	17.40	0.0592	100.0
1961	43.50	22.63	16.00	17.80	0.0683	100.0
1962	43.75	22.56	16.27	17.33	0.0940	100.0
1963	43.27	23.11	16.10	17.43	0.0891	100.0
1964	43.18	23.09	16.21	17.41	0.0975	100.0
1965	43.25	21.92	16.01	18.70	0.1165	100.0
1966	43.35	21.99	15.30	19.22	0.1300	100.0

Source: Transport Economics, Bureau of Economics, Interstate Commerce Commission, November-December 1967, p. 5.

Exhibit II-14

LEVELIZED BREAKEVEN COSTS OF
NUCLEAR ELECTRIC UTILITY PLANTS
IN NEW ENGLAND FOR PLANT START-UP YEARS 1970-1980

	Year of Plant Start-Up and Plant Size (Net MW)								
	1970			1975			1980		
	450	650	1000	450	650	1000	450	650	1000
Total Nuclear Cost (mills/KWH)	4.78	4.27	3.92	4.33	3.90	3.60	4.19	3.77	3.47
Competitive Coal Cost (mills/KWH)	2.42	2.12	1.19	1.99	1.76	1.59	1.83	1.61	1.45
(¢MM BTU)	27.2	24.0	22.7	22.3	19.9	18.9	20.6	18.3	17.3

Source: Future Market for Utility Coal in New England Report to Office of Coal Research, United States Department of the Interior, November 1966, by Arthur D. Little, Inc., Cambridge, Mass.

NOTE: Achievable coal cost with cost savings recommended by report is estimated at 20.6¢/ MM BTU computed as follows:

Purchase price of coal	14.8¢/MM BTU
Unit train cost	5.8¢/MM BTU

Exhibit II-15

MAJOR CONCLUSIONS AND RECOMMENDATIONS
CONCERNING FUTURE MARKET FOR UTILITY COAL IN NEW ENGLAND

Conclusions

On the basis of apparent trends in energy-fuel demand and the projected cost relationships of alternative utility fuels, we conclude that:

1) If no action is taken to reduce delivered coal costs significantly from present levels, it seems inevitable that utility coal consumption in New England, after experiencing steady growth over the past 15 years, will reverse and begin a steady and continuing decline, at first largely because of loss of existing plant market to residual fuel oil, and later largely because of loss of new plant market potential to nuclear power.

2) If, as a consequence of initiating the purchasing and transportation innovations previously described, the delivered costs of coal can be reduced significantly, it seems very likely that coal will experience expanding demand through 1970, after which it will be able to preserve a market of from 9 million to 13 million tons per year through 1980. This would serve to keep coal competitive in New England and to sustain the possibility of its achieving larger markets in the future in the event that now unforeseen circumstances affect the supply and/or costs of substitute fuels.

3) The potential market for coal appears large and stable enough to justify taking action to reduce delivered costs. Incentives for such action in the form of lower fuel costs, increased coal sales, or higher gross freight revenues realizable by <u>individual companies</u> seem more than adequate. There is additionally the incentive, from the utility point of view, of preserving coal as an effective competitor in the region's fuel economy.

Recommendations

We therefore recommend that:

1) The New England utilities evaluate the feasibility

of coordinating their coal purchases as a basis for creation of a large-scale, integrated transportation system serving multiple power plants in New England. This might be accomplished by a joint committee consisting of experienced purchasing and traffic personnel, possibly under the auspices of the New England Electric Coordinating Council.

2) In the event the utilities, after their evaluation, form such a committee, major coal producers who are interested in the New England bituminous-coal market should independently assess the proposed plan, either in whole or in part, as a means of meeting the competition of other fuels and expanding their sales within the region. These companies should then work closely with both the utilities and the carriers to identify ways in which coal costs can be reduced in light of opportunities presently available.

3) Individual rail and water carriers should explore the applicability of new technology (e.g., unit trains, high-capacity vessels, and improved terminal facilities) to coal traffic moving to New England utilities, and should evaluate what reductions in rates or handling charges are required (and justified) to preserve this important body of traffic.

4) Because of the high degree of inter-industry coordination required to accomplish planning on a region-wide scale, organizations concerned with promoting use of domestic coal resources should continue to stimulate, facilitate, and otherwise support cooperation among producers, carriers, and consumers to effect reduction in delivered costs that will serve to enhance the competitive position of coal in such fringe geographical markets as New England.

Source: Arthur D. Little, Inc., Future Market for Utility Coal in New England, November 1966, Cambridge, Mass., pp. 11-12.

power industry's decision to go to atomic plants is based on present rates, a serious misallocation of resources could result. The construction of the atomic plants would for many years prevent any return to steam coal. Such decision, if made in the absence of full knowledge of possible lower coal rates, may not only prevent lowest practicable power costs, but further weaken the railroad system on which New England depends for important parts of its interregional traffic. That this is not only a matter of general governmental concern, but also a specific regulatory responsibility is the conclusion of MacAvoy and Sloss in "Regulation of Transport Innovation."*

14. Responsiveness of Rail Network to Region's Freight Service Needs

With these exceptions, the rail system of the region appears to provide the freight service which is needed. The problems of the terminating road which have so long plagued the region's two large roads will be solved for the New Haven by inclusion in the Penn Central. This makes it even more imperative to hasten the N&W-C&O merger, with the B&M included (not to be confused with the N&W inclusion case), thus providing the same relief to the B&M's similar terminating road problems and enormously strengthening the region's rail system.

The capacity of the rail system is ample, even after contemplated merger, for future growth. Current rail technological developments indicate greater rather than less use. Such improvements as large capacity cars, specialized cars, and unit trains tend even more to emphasize rail's traditional superiority in low-cost haulage of heavy volumes. TOFC and container service, conversely, show promise of increasing the rails' share of lighter, high-rated commodities. Dependability of service leaves much to be desired, but the spur of competition is much more effective in this respect than governmental action.

The current competition between different modes is forcing a basic change in freight rate structure. For many years freight rates have been based on a concept of value of service with very little reference to cost. Now railroads are pressing for the right to lower their rates by taking advantage of the low marginal cost which their technology and cost structure offer. The resulting downward trend of rail rates is of special interest to New England because the region's geographical position generally requires a long haul to supply it with raw materials, food, fuel, and other

*Random House, New York, 1967.

supplies. Although the shift to cost basis can emphasize New England's distance from sources and markets, there is little doubt that on balance the region gains from rate reduction. As developed earlier, New England's rail traffic is heavily overbalanced eastbound. Any general movement toward cost-based rates which took account of the back-haul opportunities presented by this up to now unexploited imbalance would alone outweigh the increased emphasis on distance.

This development of low cost haulage of large volumes of bulk materials together with containerization and TOFC has led to a concept of railroads as main line haulers only. Because of this some have urged that branch lines and way stations be abandoned as a matter of principle in order to accomplish the cost reduction. Their point is that containerization, for example, can only eliminate terminal costs if the terminal operation is, in fact, abandoned. So long as conventional railroad traffic is still handled, however, there must be a classification and distributive process, with its high cost. (Exhibit II-16) It is not possible to wave a magic wand and have all traffic transformed overnight to the ideal arrangement, but both types of operations must be kept going until the transaction is complete or a balance between them is achieved. At the same time, it is important that every opportunity to achieve the ultimate ideal of elimination of terminal costs be seized. The ultimate transformation of the nation's railroads into movers of nothing smaller than 1000-ton lots of freight, with all further distribution being moved by highway carriers to which containers could efficiently be transferred may be a dream, but it is most enticing in its unparalleled promise of reduction in the cost of just about everything.

E. PASSENGER SERVICE

1. Present

Passenger service on New England railroads, once more frequent and more heavily patronized than that of any other region, has dwindled almost to the vanishing point. The Atlantic Limited of the CPR between Montreal and St. John crosses Maine in the middle of the night, stopping at four points. This is the only remaining service in Maine, and there is none in New Hampshire or Vermont. Commuter service is provided for a short distance out of Boston by the B&M and the New Haven, supported by the Massachusetts Bay Transportation Authority.* The PC operates one round trip

*The B&M's and part of the New Haven's commuter service is legally discontinued, but is operated under contract with the MBTA. The PC has applied for total discontinuance of its Boston commuter service.

Exhibit II-16

COMPARISON OF BOXCAR AND TOFC CARLOAD[1/]
COSTS AND UTILIZATION IN OFFICIAL TERRITORY
1965

Official Territory	Type of Equipment	Out of Pocket Expenses: Empty Return Ratio[2/]	Line Haul Per Loaded Car Mile (¢)	Terminal Per Car Load ($)[3/]
Region I New England				
	Box-General Service	.59	30.479	76.08
	Box-Special Service	.69	36.212	81.02
	TOFC	.21	30.186	94.04
Region II Official Territory Excl. N.E.				
	Box-General Service	.46	17.778	67.45
	Box-Special Service	.83	24.713	72.30
	TOFC	.19	20.930	105.14
Region III Official Territory				
	Box-General Service	.47	18.273	67.87
	Box-Special Service	.83	25.238	72.73
	TOFC	.20	21.443	104.13

1/ See Exhibit II-30 for conversion factors from carload units to trailerload units.

2/ Expresses percent of total car-miles which are empty car miles.

3/ TOFC Terminal Costs do not include cartage to and from rail-head which ranges between $20 and $80 per trailer. Boxcar costs do not include way freight costs if required for pick-up or set-out of carload, but do include such cost if within terminal area.

Source: Rail Carload Unit Costs by Territories for the Year 1965, Statement No. 7-67, ICC Washington, D.C., May 1967.

daily between Boston and Chicago, and another between Boston and Albany with connections to and from Buffalo. The New Haven operates a substantial frequency between Boston and New York via Providence, New London, and New Haven, serving intermediate points to some extent. In addition, local service is operated between Boston and Providence and connecting service between Worcester and New London, and between Springfield, Hartford, and New Haven, Waterbury and Bridgeport, and Pittsfield and South Norwalk. More frequent commuter service is offered between New Haven and New York, the frequency increasing as New York is approached, including commuter service on the branch between New Canaan and Stamford. Most trains use Grand Central Terminal in New York, but a few, including four through Boston-Washington trains in each direction, operate over Hell Gate Bridge via Pennsylvania Station.

2. Passenger Service Needs

The region's needs for passenger service can be discussed by geographic sectors very similar to those followed in the description of existing service. Underlying any description of rail passenger service needs is the amply demonstrated overwhelming preference of the public for automobile transportation over any other. (Exhibit II-17) In the nation, autos produce nearly 90% of the intercity passenger miles, and in New England, where distances are short, it is probably higher. These percentages grew steadily and rapidly while substantial and frequent public transportation services were available, over several decades, interrupted only by wartime restrictions. Cost alone does not seem to affect the demand, since low cost modes are as much affected as high cost. Speed does not seem to affect the demand, since even air transportation cannot capture more than a small fraction of the traffic in the distances typical of New England travel, except by high frequency, and even then only to a limited extent. New highways are still decreasing automobile travel time, and there is no reason to suppose this trend will change in the near future, except in special situations.

a. Satisfactory Application of Characteristics of Bus Service

A corollary of this highway development is that busses have taken advantage of the improved highways greatly to improve their service, and offer service generally throughout the region without the need of any attention by government except the provision of highways. (Cf. discussion in Chapter III) Their fares are lower than those of other modes except for special rail round

Exhibit II-17

COMPARISON OF INTERCITY PASSENGER-MILES
BY MODE 1959-1966 1/
(Aggregates in Millions)

Year	Railroads and electric railways	Motor Vehicle: Motor Carriers of passengers 3/	Motor Vehicle: Private automobile	Inland waterways 4/	Airways (domestic)	Grand total
1959	22,373	20,364	687,406	2,026	32,566	764,735
1960	21,574	19,327	706,079	2,688	33,958	783,626
1961	20,527	20,279	713,636	2,345	34,599	791,386
1962	20,181	21,801	735,931	2,736	37,491	818,140
1963	18,632	22,538	765,877	2,763	42,765	852,575
1964	18,374	23,344	801,796	2,838	49,185	895,537
1965	17,557	23,775	817,663	3,101	58,083	920,179
1966 2/	17,268	24,592	856,358	3,447	69,356	971,021
			Percentage of grand total			
1959	2.93	2.66	89.89	.26	4.26	100.0
1960	2.75	2.47	90.10	.34	4.33	100.0
1961	2.59	2.56	90.18	.30	4.37	100.0
1962	2.47	2.66	89.95	.33	4.58	100.0
1963	2.19	2.64	89.83	.32	5.02	100.0
1964	2.05	2.61	89.53	.32	5.49	100.0
1965	1.91	2.58	88.86	.34	6.31	100.0
1966	1.78	2.53	88.19	.35	7.14	100.0

1/ Agency descriptions are the same as in the Annual Report of the Commission.

2/ 1966 data are preliminary.

3/ School bus data are excluded.

4/ Including W.H.,M.V.,& Nantucket S.S., Great Lakes lines, Mississippi River lines, intercoastal service, et al.

Source: Transport Economics, Bureau of Economics, Interstate Commerce Commission, November-December 1967, p. 8.

trip rates, and their capacity in most cases is ample to provide for the five percent non-automobile trips. Under these circumstances, there is no need for rail passenger service unless one of the following three criteria obtains:

(1) It is substantially faster than bus.

(2) It is substantially cheaper than bus, or

(3) The demand is so great under constraints of land use that the capacity of rail service is needed.

b. Application of Criteria to Northern New England - Speed

In Northern New England such need does not appear. Conventional rail service is not faster than bus, and the upgrading of rail lines to ultra-high-speed standards is so expensive that a volume far greater than anything in sight is needed to make it economic. The problem of upgrading rail lines is complicated by the existence of many more highway grade crossings in Northern New England than, for example, on the New Haven's Shore Line. One technological change which could upset this trend away from rail travel is in prospect. The demonstration train built by United Aircraft incorporates a new method of suspension which is said to permit substantially higher speeds on a track maintained to good freight service standards. If this claim is substantiated, then demonstration projects operating the new type of service for a trial period should be tried in Northern New England to see if the higher speed would attract patronage. Cost of such a demonstration would have to be borne by government, but a commitment of some two million dollars would cover the cost of any of these demonstrations for long enough to determine if it could be successful. If so, the cost would be largely defrayed by revenue and the commitment could be applied to another demo. The promising areas (other than Boston-New York, discussed later) which should be explored, considering demand, existing rail lines, and historic patterns, are the following:

(1) Boston-Portland-Bangor-St. John

(2) Boston-Nashua-Manchester-Concord-White River Junction-Montpelier-Burlington-Montreal

(3) New York-Hartford-Connecticut River Line-White River Junction-Montpelier-Burlington-Montreal

(4) Boston-Fitchburg-Gardner-Greenfield-North Adams-Utica-Syracuse-Rochester-Buffalo

(5) Boston-Worcester-Springfield-Pittsfield-Albany

(6) Boston-Worcester-Springfield-Hartford

c. Application of Criteria to Northern New England -Cost

Conventional rail service is also generally priced higher than bus fares, sometimes higher than air fare. These high fares do not appear to be the result of marginal cost, or of cost characteristics, but rather the result of low and diminishing volumes, managerial policy, and rigid labor work rules. Cost studies show unit cost per passenger higher than bus or air costs.

ESTIMATES OF DIRECT COST PER PASSENGER TRIP FOR COMMON CARRIERS BETWEEN SAN FRANCISCO AND LOS ANGELES

Cost Category	Coach Train	Boeing 727	Bus
Labor	$5.17	$1.25	$4.81
Equipment	8.85	3.39	2.51
Fuel	.59	1.87	.85
Other	3.80	1.81	.94
Additional Passenger Cost	--	1.57	--
Total	$18.41	$ 9.89	$ 9.11
Number of Passenger Trips Per Day	170	511	28

Source: Rail Passenger Traffic in the West, SRI, Tables 10 and 12.

It is, however, easy to see at a glance that if the totals were divided by the number of passengers who could be accommodated by a train rather than the small number actually on board, the unit cost would be much less than that of the other mode. Experimentation in Canada by the CNR with fares which reflect this cost capability have produced very substantial changes in travel patterns. Low fares have greatly increased load factor, thus producing the desired lower unit cost. Changes in the pricing of freight services to reflect cost capability have likewise reversed trends. A notable example is the freight traffic in new automobiles. Under conventional practices and prices, 93% of this traffic gradually changed from rail to truck. By constructing a car

which would hold from twelve to eighteen autos and lowering rates correspondingly, the railroads recaptured over half of this traffic in two to three years and their share is apparently continuing to increase. A similar attack on passenger pricing, if coupled with a relaxation of certain requirements of labor (including but not limited to make-work legislation such as the Massachusetts law requiring a trainman for each two cars) might produce similar reversal of trends. Such an attack is not likely to happen without governmental encouragement. Attrition would take care of the human problem of redundancy rapidly, since service would be increased, and this fact should lessen labor resistance.

d. Application of Criteria to Northern New England -Capacity - Boston Commuter Service

The third criterion, need for high capacity, occurs in Northern New England only in the case of travel to and from Boston from the commuter area. (Exhibits II-18, II-19, and II-20) The demonstration project of the Mass Transportation Commission in Massachusetts in 1963 showed a pressing need for the continuation of certain service, little need for others, and indications of possible unfilled needs. Since that time the MBTA has supported the hard core of the needed service, but without any indication of development and with real danger that it will be allowed to lapse from lack of political understanding of its importance. Considerable confusion exists as to trade-offs between rapid transit extensions and rail commuter service. There is no hard and fast rule, but certain of Boston's lines are clearly long enough to require the scheduling, infrequent stops, and complete seating usually associated with rail service. On the B&M the lines so designated are those to Rockport, Lowell, and South Acton. The line to Reading, if considered by itself, might be satisfactorily transformed into a rapid transit extension but it shares so many costs with the other lines that it adds nothing to the over-all deficit, and it should therefore be included in the lines deemed essential.

The Penn Central's one line to Framingham and Worcester was not involved in the MTC demonstration. Based on distance, it would seem to represent a needed service, but its volume, which, unlike that of other services, is declining, together with the relatively (to other highways) high capacity of the Massachusetts Turnpike, make this doubtful. The various services of the New Haven, except for the main line, appeared from the MTC demonstration to be satisfying needs which could readily be met in other ways. An appropriate arrangement of rapid transit extensions and bus lines which could completely supersede New Haven services other

EXHIBIT II-18

PASSENGERS IN AND OUT BOSTON

YEAR	NUMBER
1927	24,735,593
1928	22,135,533
1929	21,093,197
1930	19,289,565
1931	16,721,324
1932	13,887,070
1933	12,164,198
1934	12,825,605
1935	13,110,082
1936	14,308,555
1937	14,705,115
1938	13,406,223
1939	12,529,685
1940	12,119,745
1941	12,382,326
1942	16,873,394
1943	20,434,336
1944	20,450,659
1945	20,185,753
1946	18,815,240
1947	17,129,555
1948	14,941,146
1949	11,850,563
1950	10,577,292
1951	10,441,832
1952	11,892,093
1953	12,644,782
1954	13,544,110
1955	13,777,983
1956	14,443,652
1957	14,036,541*
1958	11,034,169
1959	7,798,319ƚ
1960	4,700,964
1961	4,492,317
1962	4,271,106
1963	4,255,031
1964	4,263,682
1965	4,061,125
1966	3,785,248
1967	3,646,725

*Partially estimated.
ƚOld Colony discontinued 6/30/59.

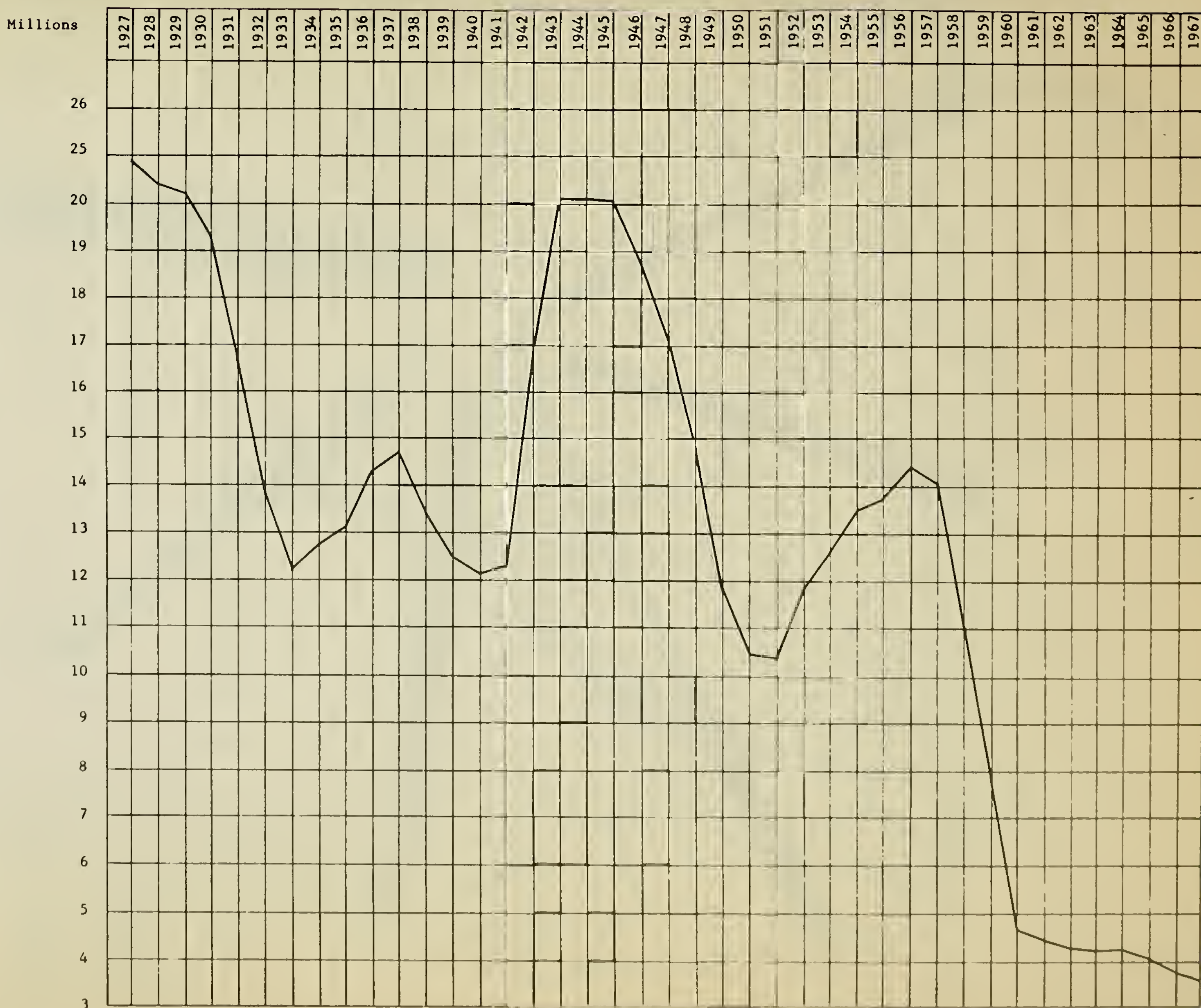
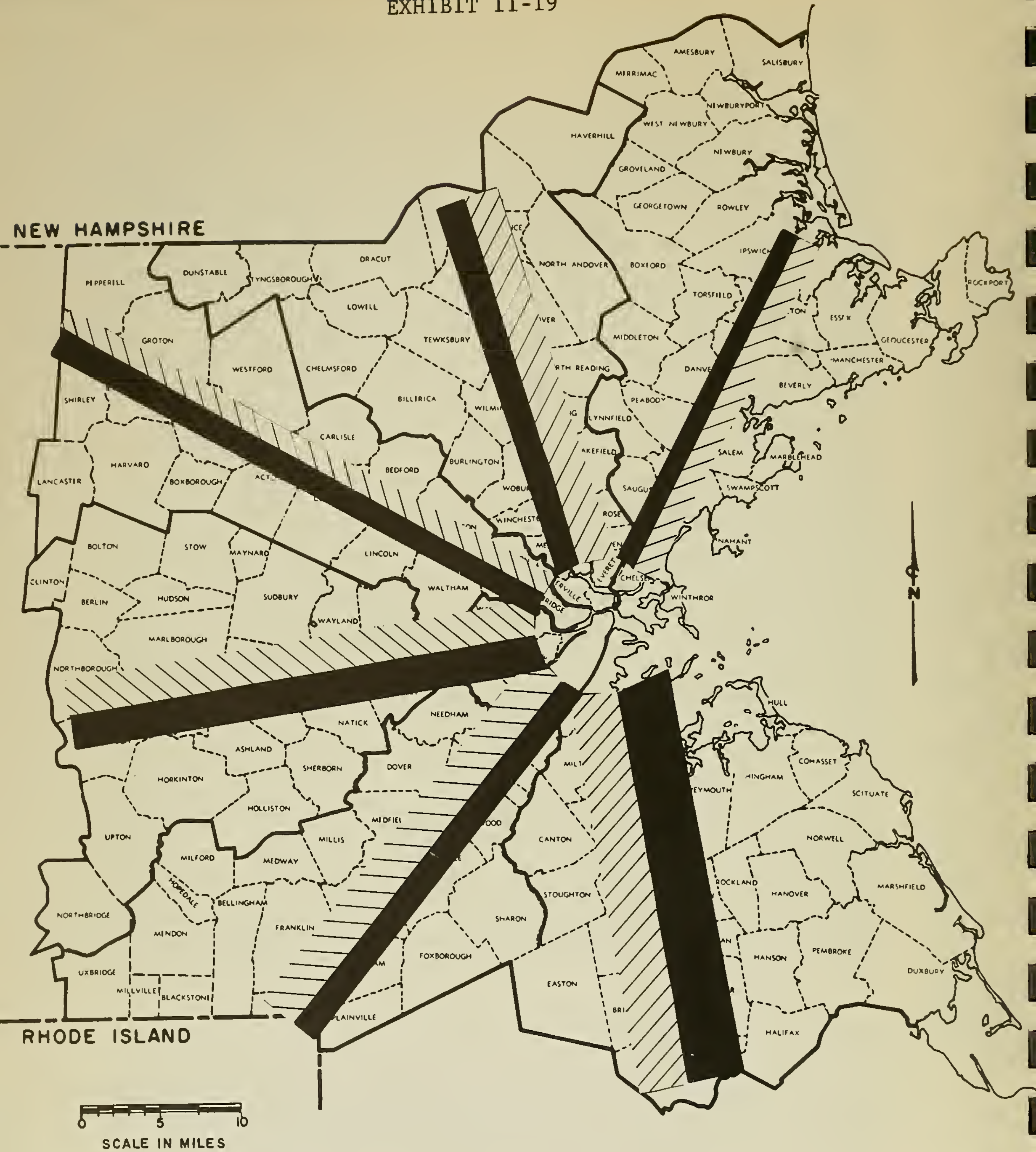
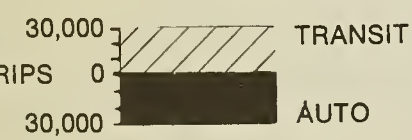


EXHIBIT II-18

Source: New Haven Railroad Statement, ICC-FD23731.

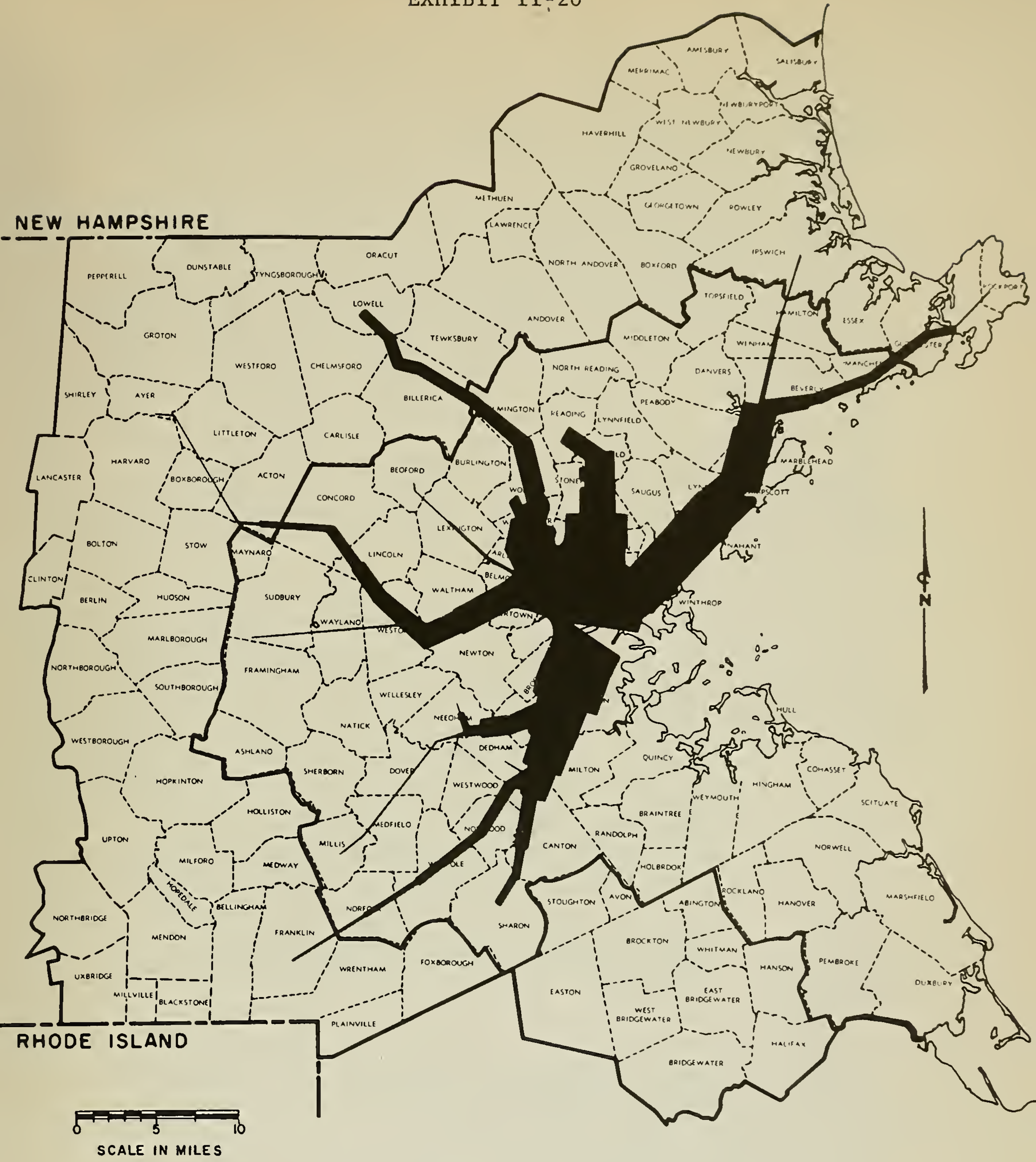
EXHIBIT II-19

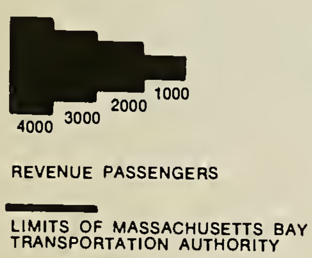




24-HOUR PERSON TRIPS WITHIN
THE BOSTON REGION
TO BOSTON PROPER
FROM SIX EXISTING CORRIDORS BY MODE

Source: Boston Redevelopment Authority, 1967 Transportation Facts





1965 DAILY INBOUND RAILROAD PASSENGER FLOW MAP
FOR BOSTON AND MAINE RAILROAD
AND NEW YORK, NEW HAVEN AND HARTFORD RAILROAD
(Contract Service Only)

Source: Boston Redevelopment Authority, 1967 Transportation Facts

than that of the main line is set forth in the report of the Mass Transportation Commission.*

e. Desirable Extensions of Boston Commuter Service

The possible extension of Boston commuter service which shows greatest promise is the extension beyond Lowell to the New Hampshire cities of Nashua, Manchester, and Concord. Schedules recently drawn up proposed eight round trips between the three cities and Boston, one of them being extended to Laconia and another to White River Junction by utilizing three rail diesel cars (plus allowance for stand-by equipment). Incremental costs over the existing Lowell operation would not appear to be greater than revenue earned just prior to discontinuance. The real difficulty appears to be political, since it involves cooperation between the MBTA, the B&M Railroad, and the state of New Hampshire, a problem which would appear to be within the purview of the Commission. It is recommended that the Commission bring these agencies together to investigate the possibilities of such service.

One minor extension of intensity rather than geographical scope which would appear worthy of attention is the establishment of off-peak service on the Penn Central. The MTC demonstration showed that a commuter service provided only in peak hours was rarely if ever viable and that off peak service of substantial frequency was necessary even to maintain the demand for the peak hour service. The Penn Central Boston commuter service has for years been provided only at peak hours, and this may be its chief difficulty. The matter can readily be tested by hourly service between Boston and Framingham, provided by two rail diesel cars (plus allowance for stand-by equipment) at a cost probably less than $0.5 million per year. Since this project falls entirely within the province of the MBTA, it should be unnecessary for the Commission to do any more than ask for its consideration on the grounds of intermodal coordination. The Commission should, however, be concerned with study of the possible extension of such service to Worcester.

One remaining extension of Boston commuter service which is of remote significance might be worth mentioning. An untried experiment is the application of ultra-high-

*Mass Transportation in Massachusetts, Final Report on MTC Demonstration Project, 1964. Because the MTC Report and other studies thoroughly cover the problem of urban transportation, this report has confined its discussion of urban transport problems to those of rail commuter service. The important questions of rapid transit extensions and urban bus services are not discussed.

speed rail technology to the commuter problem with a view toward extending the residential area open to workers in the core city for a matter of 100 miles with a trip of one hour or less. Although perfectly feasible with available tested methods, this would involve capital expenditures of hundreds of millions of dollars, with substantial operating deficit for some years. Obviously, such an expenditure is not to be undertaken lightly, but the promise of benefits in opening available land space to urban workers, reversing the tendency to congestion, seem to make it well worthy of further study. The cost could be lessened considerably by upgrading such existing rail lines, for example, as the B&M to Portland or to Greenfield, to standards permitting the operation of frequent service (at least hourly) with 160 mph cars similar to those soon to be operating between New York and Washington.

f. Boston-New York Passenger Service

The remaining passenger service in New England is the most important. Boston-New York represents a passenger market not only many times larger than any other non-commuter New England market, but far larger than any other in the country, except New York-Washington. As a rail market, Boston-New York has always vied with New York-Washington for top place. As an air market Boston-New York is consistently in first place in number of passengers as reported by CAB-certificated carriers. Because of this it is given special treatment in Appendix B, but the problem will be briefly described here. Other branch-line services of the New Haven are not separately described because, except for Hartford-Springfield, they are essentially tributary to the through Boston-New York service. The Hartford-Springfield market is too substantial in itself to be called tributary, but the fact remains that whatever solves the Boston-New York problem and the New York commuter service problem will, by common usage of New Haven-New York track and extension of similar upgrading New Haven-Springfield, solve the Hartford-Springfield problem as well.

The problem of Boston-New York service is of true regional and intermodal interest because of the serious airway and highway congestion in the area. SARC's analysis of future air needs in the Northeast Corridor for the Commerce Department* forecasts "severe and intolerable congestion." The transportation planning survey of Connecticut** manifests the concern of planners regarding highway congestion and land use. Meanwhile, the available capacity of the rail line goes largely unused, essentially because its service is slower than that of other modes (and slower than

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*Systems Analysis and Research Corporation, Feasibility and Cost of Expanded Air Service in the Washington-Boston Corridor, U.S. Department of Commerce, 1963.

**Op.cit.

it used to be)* and suffers from the general deterioration and low morale of neglect.

New rail service between Tokyo and Osaka in Japan and between London and Manchester in England, although somewhat slower than the service herein proposed, has attracted an estimated 35-50% of the air market. The Boston-New York service herein proposed is faster, and should attract a larger percentage. Such shift of travel would afford material relief to the airports and airways, as explained in the Northeast Corridor Air Study cited above.

The number of passengers carried by the New Haven Railroad between New York and Boston was 1.3 million in 1920, and declined erratically to a depression low of 623,000 in 1933. (Exhibit II-23 charts Boston-New York passengers. Exhibit II-24 shows the relative importance in revenue terms of the different New Haven passenger services. Exhibit II-25 shows the effect of the elimination of passenger service on New Haven's income.) Drastic fare cuts brought the total back over a million and the wartime peak which followed was 4.4 million in 1944. The first post-war year of 1946 showed 3.1 million, but the 1947 total was 2.3, declining in 1949 to 1.6. Faster schedules and new equipment caused a modest resumption of growth until 1956, when performance deteriorated, schedules were lengthened, and the decline began again. The decline became precipitous in the early 1960's when air shuttle service was inaugurated and highway improvements brought the elapsed time of an auto trip down to about the same as train time. In 1967, the railroad carried 357,000 Boston-New York passengers, the airlines about 2 million, and the busses an estimated half-million. It is noteworthy that the total carried by all these common carriers by all modes is less than the total on the railroad alone in the first post-war year a

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*The history of the New Haven's best schedules between Boston and New York is indicated by the following tabulation:

Year	Fastest Schedule	Number of Week-day Round Trips on this Schedule
Before 1929	5h 10m	2
1929	5h	2
1930	4h 45m	1
1933	4h 45m	2
1940	4h 15m	2
1942	4h 20m	2
1949	4h	3
1956	4h 15m	2
1962	4h 15m	1 1/2

Source: Railroad time tables.

ALL ROUTES, INCLUDING SPRINGFIELD LINE

YEAR	THRU PASSENGERS NEW YORK-BOSTON
1927	1,286,734
1928	1,260,413
1929	1,276,024
1930	1,179,391
1931	971,178
1932	743,913
1933	623,095
1934	728,271
1935	803,463
1936	1,080,114
1937	1,206,599
1938	1,063,080
1939	1,135,581
1940	1,192,175
1941	1,413,865
1942	2,601,519
1943	3,890,528
1944	4,413,270
1945	4,132,382
1946	3,089,518
1947	2,287,270
1948	1,913,890
1949	1,596,967
1950	Not Available
1951	Not Available
1952	1,703,380
1953	1,648,861
1954	1,609,995
1955	1,539,593
1956	1,591,333
1957	1,388,959
1958	1,090,945*
1959	877,445*
1960	877,164*
1961	739,430*
1962	663,533*
1963	544,738*
1964	538,461*
1965	490,435*
1966	436,703*
1967	357,449*

*Shore Line only.

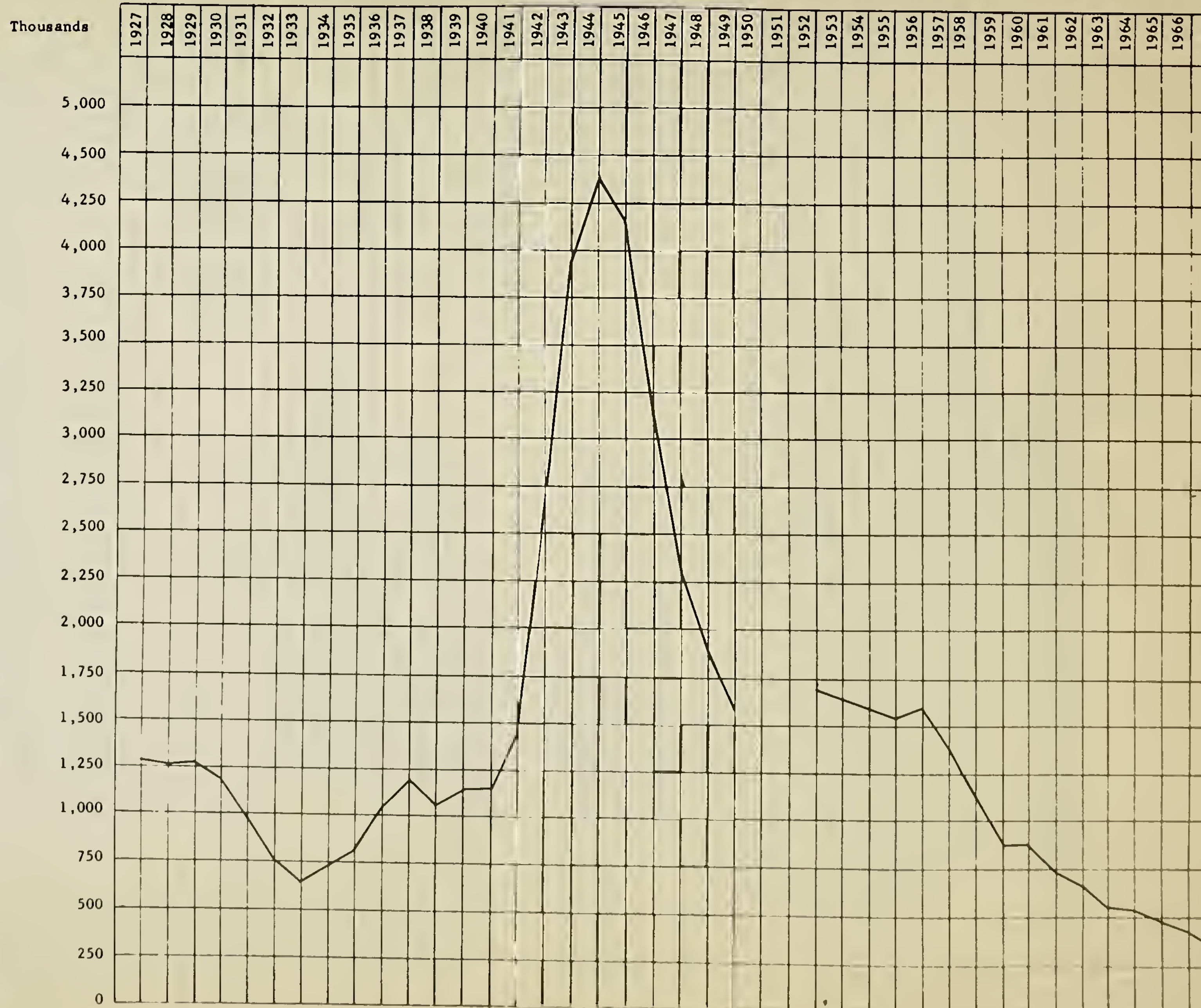

EXHIBIT II-23

Source: New Haven Railroad Statement, ICC-FD23831.

Exhibit II-24

SUMMARY

ACCOUNT 102 REVENUE

YEAR 1964

ESTIMATED DISTRIBUTION OF
ACCOUNT 102 REVENUE AMONG SERVICES
(NEW HAVEN RAILROAD)

Shoreline Trains	$13,722,737
Cape Code Summer Trains	258,212
Springfield Line Trains*	6,132,964
Subtotal	20,113,913
East End Trains (Providence and East, Minus Shoreline Trains)	2,016,944
West End Trains (New Haven and West, Incl. New Canaan & Danbury Branches But Minus Shoreline and Springfield Line Trains)	18,570,359
Balance of Service	196,024
TOTAL	$40,897,240

* These trains also serve many important Connecticut cities en route to New York.

Source: New Haven Railroad statement in ICC Finance Docket 23831, Passenger service discontinuance, decided March 1, 1966.

Exhibit II-25

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY
(RICHARD JOYCE SMITH, WILLIAM J. KIRK, HARRY W. DORIGAN, TRUSTEES)

EFFECT OF ELIMINATION OF PASSENGER SERVICE ON INCOME
YEAR 1964

	Actual All Services (1)	Due to Passenger Services (2)	Remaining with Freight Service Only (3)
Operating Revenues			
Freight	$ 63,784,020	$ -	$63,784,020
Passenger	40,897,240	40,897,240	-
Mail	6,388,342	6,388,342	-
Express	1,828,701	1,746,409	82,292
Dining & Buffet	1,856,331	1,856,331	-
Jt.Facility-Net	2,279,707	2,279,657	50
Other	4,563,030	1,638,871	2,924,159
Total	121,597,371	54,806,850	66,790,521
Operating Expenses			
Maint. of Way & Structures	17,304,946	7,109,581	10,195,365
Maint. of Equip.	24,281,952	13,525,523	10,756,429
Traffic	2,473,477	790,924	1,682,553
Transportation	61,745,821	29,640,817	32,105,004
Misc. Operations	2,470,014	2,442,972	27,042
General	6,928,121	2,949,430	3,978,691
Total	115,204,331	56,459,247	58,745,084
Railway Tax Accruals	9,030,688	3,834,238	5,196,450
Hire of Freight Cars	9,429,711	-	9,429,711
Other Equipment Rents -Net Dr.	176,416	Cr.130,111	306,527
Joint Facility Rents -Net Dr.	4,812,487	5,000,841	Cr.188,354
Net Railway Op. Income	Df.17,056,282	Df.10,357,365	Df.6,698,897
Other Income:			
Grand Cent. Term.	5,307,043	4,784,523	522,520
Other	5,347,205	-	5,347,205
Misc. Deductions from Income	1,923,909	357,932	1,565,977
Amount Available for Fixed Charges	Df.8,325,923	Df.5,930,774	Df.2,395,149

Source: New Haven Railroad statement in ICC Finance Docket 23831, Passenger service discontinuance, decided March 1, 1966.

full twenty years earlier. Certainly traffic has grown in those two prosperous decades of substantial population and GNP growth, and the only place for it to be is on the highway.

The New York-Washington high-speed trains soon to operate will give some indication of the ability of such service to attract passengers from overcrowded airways and highways, but not conclusive proof at their proposed three-hour schedule. It seems a reasonable postulate that rail service must at least approach the city-to-city time of an airplane trip and be clearly faster than the auto and bus in order to accomplish the relief needed. Two and a half hours is certainly the maximum time which can be said to meet these objectives.

The OHSGT* study of the cost of upgrading the New Haven railroad to such a standard estimates the cost at $626 million, but other estimates are less. One preliminary investigation has been made which suggests use of existing high-grade portions of the lines, such as the Boston and Providence, and minimum realignment, probably only the thirty-six miles Westerly to Saybrook, at a cost half as great. This investigation, outlined in Appendix B, shows promise that the enterprise could pay its way with three million passengers at a fare less than bus fare, and be financially well off if the volume grew in ten years to 4.5 million, surely a modest forecast.

Bus connections to such train service could serve much of the remainder of the region, including all of Northern New England. Intelligent coordination of bus and train schedules, with easy cross-platform connections, should extend the benefits of the service to the whole region. Such coordination would also stimulate bus travel to an extent more than enough to make efficient use of any equipment and personnel displaced from the Boston-New York run.

If this is true, it is clearly a proper governmental concern to act as a catalyst to bring about such a happy solution, if only by a guaranteed loan. Senator Pell has long advocated a "systems approach" to transport in crowded urban corridors. His suggestions to President Kennedy in 1962 developed into the Northeast Corridor Project of President Johnson, now being conducted by the OHSGT, showing that highways alone will not relieve the problem of transportation, and recognizing the crowded condition of the airways. Senator Pell has championed the development of a service such as that herein recommended. His views are set forth

*Office of High Speed Ground Transportation, U.S. Department of Transportation.

in a recent book, "Megalopolis Unbound."*

More fundamentally, it seems to be a regional concern of the highest priority to see that red tape is cleared away and this improvement accomplished as early as possible. Since the prospect is for a viable economic entity, the most desirable method would seem to be a government guarantee of a loan to the railroad or any other agency who will undertake the necessary construction and operation to acceptable standards. The enormous benefit would be the solution of the region's most important and most pressing transportation problem. Senator Pell's invaluable work paves the way for such a request.

An interesting sidelight comes from consideration of the geography of the line together with the airport needs of the region. New York needs a new airport which must be far enough out to get land at a reasonable cost and be able to grow. Boston faces a similar need for a new airport. It is easy to imagine a new international airport with its terminal building constructed astride an ultra-high-speed rail line serving Boston and New York, each in little over an hour. Providence, New Haven, and the Connecticut suburbs of New York would be en route. Hartford would be reached by a superhighway planned by the State of Connecticut. Transatlantic SST's would be over water almost immediately upon takeoff, probably before reaching supersonic speed and creating sonic boom. A transportation center would be created whose importance to the region it would be difficult to overestimate.

It should be noted that the State of Connecticut is currently undertaking a thorough study of that State's short-term (1975) and long-term (2000) airport needs. Their study will take into account, among other things, all existing airports and facilities in Connecticut, current and projected air traffic levels, and local, regional and state development plans. In the Connecticut study, the feasibility and impact of a major new airport in Connecticut will be examined, along with other air facility requirements. The airport concept presented here must be evaluated in the light of the findings of the Connecticut study.

*Frederick A. Praeger, New York, 1966.

Exhibit II-26

DEFINITION AND EXPLANATION OF TOFC PLANS

Plan	Originator	Who Supplies What	Who Delivers and Picks Up	Basis of Rate
I	Motor Carrier	Motor Carrier supplies trailer, loads & unloads trailer on railcar. Railroad furnishes flatcars.	Motor Carrier	Shipper pays motor carrier rates. Motor carrier pays railroad flat charge per trailer.
II	Railroad	Railroad supplies trailer and all services.	Railroad	Railroad commodity rates (usually equal to motor carrier rates).
II-1/2	Shipper or Forwarder	Railroad supplies trailer and flatcar.	Shipper or Forwarder	Flat charge per trailer, or per two trailers with special rates for 60-40 mix of commodities.
III	Shipper or Forwarder	Shipper or forwarder furnishes trailers (owned or leased);railroad furnishes flatcars, loads and unloads trailers from flatcars.	Shipper or Forwarder	Flat rate per trailer or per two trailers with requirement for 60-40 mix of commodities.
IV	Shipper or Forwarder	Shipper or forwarder furnishes flatcar and trailer.	Shipper or Forwarder	Flat rate and requirement for 60-40 mix of commodities.
V	Motor Carrier	Motor Carrier provides hyway transport and railroad provides line haul.	Motor Carrier	Rail carrier tariff for joint motor-rail rates.

Source: SARC.

Exhibit II-27

TRAILERS AND CONTAINERS TERMINATED BY
CLASS I RAILROADS IN TOFC SERVICE, BY PLAN, 1964-1966

Item	Number of trailers and containers terminated 1/ 1966	1965	1964	Percent termination by plan 1/ 1966	1965	1964	Percent increases 1966/1965
	Thousands						
Total terminations	1,686.2	1,432.4	1,216.8	--	--	--	18
Total by plan	1,628.8	1,403.6	1,199.1	100	100	100	16
Plan I	328.7	322.3	299.0	20	23	25	2
Plan II	621.3	533.6	467.8	38	38	39	16
Plan II 1/2	69.2	53.4	44.3	4	4	4	30
Plan III	451.3	369.5	281.2	28	26	23	22
Plan IV	103.6	76.1	68.1	6	5	6	36
Plan V	54.7	48.8	38.7	3	4	3	12
Other arrangements	57.4	28.8	17.7	--	--	--	--

1/ Because of rounding all columns may not add to totals.

Source: Transport Economics, Bureau of Economics, Interstate Commerce Commission, October 1967, p. 2.

Exhibit II-27

Exhibit II-28

COMPARISON OF PERCENT OF GROSS REVENUE AND PERCENT OF UNITS TERMINATED BY TOFC PLAN ON TRAILERS AND CONTAINERS TERMINATED BY CLASS I RAILROADS IN 1964 AND 1965

	Percent of Total Revenue		Percent of Total Units Terminated	
Plan	1965	1964	1965	1964
I	13	15	23	25
II	45	46	38	39
II-1/2	7	5	4	4
III	22	21	26	24
IV	9	10	5	5
V	4	3	4	3
Totals	100	100	100	100

Source: Piggyback Traffic Characteristics, Interstate Commerce Commission, Bureau of Economics, Washington, D.C., Statement No. 66-1, December 1966.

Exhibit II-29

MOVEMENT OF TOFC TRAFFIC FOR TEN STATES WITH LARGEST ORIGINATING AND TERMINATING VOLUMES FOR ALL PLANS

	1963 Sample Number of Trailers	
	Originating	Terminating
All States	8,701	8,701
Illinois	2,442	2,094
New Jersey	631	871
California	624	540
New York	537	531
Pennsylvania	426	395
Ohio	465	212
Massachusetts	348	320
Missouri	301	411
Minnesota	228	330
Iowa	200	59

Source: Piggyback Traffic Characteristics, ICC Bureau of Economics, Statement No. 66-1, December 1966, Table 27, Unpublished Data from 1963 Waybill Sample.

Exhibit II-30

AVERAGE NUMBER OF TRAILERS
PER FLATCAR BY REGION
1965

	Average Number of Trailers per Flatcar
Region I New England	1.5
Region II Official Territory Excluding New England	1.7
Region III Official Territory	1.7
Region IV Southern Region	1.7
Region V Western District Excluding Mountain-Pacific and Trans-Territory	1.5
Region VI Mountain-Pacific and Trans-Territory	1.7
Region VII Western District	1.6

Source: Rail Carload Unit Costs by Territories for the Year 1965, Statement No. 7-67, Interstate Commerce Commission, Washington, D.C. May, 1967

Chapter III

New England's Highways

A. SUMMARY

The development of the regional highway system in New England can be traced back to the early 1800's, but the most significant benchmark was the passage of the Federal Aid Road Act of 1916. This legislation established the objective of a comprehensive system of interstate roads as well as providing funds for highway construction by the states. The road system developed was designated the Federal Aid Primary Highway System by Congress in 1921.

In 1946, the Maine Turnpike Authority financed the first link of the toll road era. In the next ten years, the mileage of toll roads grew rapidly and accounted for a significant proportion of the long-haul interstate trip market.

The 1956 Highway Act provided the means of extending a modern highway service to all regions of the country by funding the interstate highway system on a 90% Federal and 10% state basis, ending the toll road era for all practical purposes.

New England has approximately 100,000 miles of streets and highways. The Federal Aid Primary System totals about 8,500 miles in New England, which includes the 1,600-mile Interstate System. The Federal Aid Secondary System constitutes about 10,000 miles in New England. Forty-one percent of the region's road mileage is in urban areas, which is twice as much as any other region in the nation.

There are 500 miles[1/] of toll facilities in New England out of a total of 2,215 miles[2/] in the United States. Approximately 300 miles of the toll routes in New England were incorporated into the Interstate System in 1957. Congress expressed its intent to answer the question of Federal reimbursement for those highways in the 1956 Highway Act. New England has a very high stake in any decision and should press for an equitable reimbursement formula.

The travel characteristics of the region show that 63% of all highway travel is in urban areas vs. 49% in the

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1/ Including 113 miles of the Connecticut Turnpike.

2/ Ibid.

United States as a whole. New England uses its Federal aid systems more intensively than any other area of the country (4,470 average daily traffic volume in New England vs 1,780 in the United States as a whole).

Direct Federal aid is accounting for nearly half the highway construction money spent by New England's State Highway Departments. Highway construction in New England has progressed more on the FAP system in rural areas than in urban areas. On the interstate system of the region during the 1963-1965 period, $2.51 of capital funds per hundred miles of travel was spent in urban areas vs. $3.40 in rural areas, and on the remainder of the FAP system, $0.50 of capital funds per hundred miles of travel in urban areas vs. $0.91 in rural areas.

Urban congestion is a major problem in New England and the nation. The construction of the expressway system offers little help to the internal circulation problem in the urban area. Except for Boston, New England cities are of a size and population density which do not permit the use of rail mass transit technology. A means of eliminating a substantial amount of urban congestion lies in applying traffic technology in signalization, selective elimination of bottlenecks, grade separations at major intersections, application of one-way street systems, and control of access. Control of curb parking and development of off-street parking on a block-by-block basis is another method of relieving urban congestion. DOT has recognized the potential of some of these measures in its TOPICS program. The program needs to be increased and substantial funds provided to be attractive in solving the urban circulation problems in this region.

The rural highway primary system needs have been satisfied to a substantial degree by the construction of the Federal Aid Primary System. Improvements and construction of rural secondary roads and connecting roads to expressway interchanges have lagged during the period of the interstate highway system construction. Excessive development of feeder roads to expressways has in some cases resulted in expressway interchange congestion and a restriction on expressway traffic capacity at peak hours.

The establishment of standards and design criteria for feeder roads within certain distances of expressway interchanges may be desirable.

Certain additions to the planned interstate and expressway system have been suggested by various public and private agencies in the region. This report has examined three of those proposals because of their magnitude or potential significance.

A North-South highway has been proposed approximately

midway between Rte. 91 and Rte. 95 to serve and connect the population centers of Norwich, Conn., Worcester, Mass., Fitchburg, Mass., and south-central New Hampshire. The portion between Norwich, Conn., and Fitchburg, Mass., is either completed or in projected construction programs. North of Fitchburg, the remaining portion of the highway, estimated to cost $170,000,000, is under study by the Massachusetts and New Hampshire State Highway Departments.

An East-West highway across the three northern New England states to New York State has been proposed in various forms for over twenty years. The interstate road system serving Maine, New Hampshire, and Vermont has a North-South configuration. East-West travel is largely on second-class roads within the three states, and interregional East-West travel by expressway requires use of the Massachusetts Turnpike.

Three corridors for a proposed East-West highway were examined:

1. Northern Corridor - Amsterdam, Schroon Lake, N. Y.; Montpelier, St. Johnsbury, Vt.; Littleton, Berlin, N. H.; Rumford, Skowhegan, Pittsfield, Bangor, Calais, Me.

2. Central Corridor - Amsterdam, Glens Falls, N. Y.; Poultney, Rutland, White River Jct., Vt.; Lebanon, Conway, N. H.; Fryeburg, Norway, Skowhegan, Pittsfield, Bangor, Calais, Me.

3. Southern Corridor - Amsterdam, Albany, N. Y., Bennington, Brattleboro, Vt.; Keene, Concord, Rochester, N. H.; Sanford, Portland, Bangor, Calais, Me.

A cost approximation of the three routes was made indicating that the construction cost of the three routes for the design standards assumed varies from $800 million to $1.1 billion. Mileage savings by the proposed routes over the existing expressway facilities are 49 to 85 miles, and at an assumed speed of 60 mph time savings are 49 minutes to 85 minutes. Extensive traffic, route location, and cost benefit studies are required to determine the feasibility of the project.

The State of New York has evaluated several routes for a Long Island-New England bridge across Long Island Sound. The studies indicated that the most economically feasible route was from East Marion, L. I., to Saybrook, Conn. The estimated construction cost of this project was $206 million.

Another route analyzed was from Orient Point, L. I., to Graves Neck, R. I., by way of Plum and Fisher Islands. The estimated cost of this route was $420 million. This second

route might adapt itself to a joint rail-highway route to incorporate high-speed rail construction.

A connection between Long Island and New England would have a major impact on existing road systems of the region with accompanying economic effects.

The rapid increase in the number of vehicles on the highway has resulted in a 42% increase in motor vehicle deaths in the region from 1960 to 1965 vs. a 29% increase nationally. A National Highway Safety Bureau was established in 1966 which has formulated standards for state safety programs. Legislation has been passed in recent years to stimulate greater effort in vehicle and highway safety.

Planning for the "after interstate" highway program is actively under way by Federal, regional, and state agencies. By necessity, the new programs will emphasize improvement in urban circulation. Secondary road systems will also require increased expenditures in the "after interstate" program. The inroads of rapidly increasing highway maintenance budgets on total highway dollars available will become an important issue also.

The complexity of highway construction in urban areas has already made it apparent that traffic and engineering are not the only considerations in highway design and construction. Increased recognition of highway transportation as only one element in a system will need to be part of future planning and fiscal policy. Spatial priorities, sociological concerns, the tax base, and local community goals will be increasingly a part of the input for highway planning.

Included in the highway section of the report is a description of the major transportation-for-hire industries using the highways (i.e., the trucking and bus industries). The degree and type of regulation of the trucking industry are analyzed and the effect of regulation on cost and service. The service available to New England shippers is outlined, and the pressure by the trucking industry to increase weight limits and operate multiple units to compete better with the railroads for shipments in the higher weight categories is discussed. A cost analysis of New England carriers indicates that costs are high due to small shipments and short hauls on intraregional traffic as compared with other regions of the country. There are no marketing disadvantages to New England shippers seeking interregional markets.

The bus industry has become the generally available mode of public conveyance in New England. With the overwhelming preference of the public for the automobile as the means of transport, the bus, due to its flexibility of routing and ability to operate with low passenger density, serves most of New England and in much of the area is the sole public carrier. Only in the Boston-New York intercity service does a higher-capacity transportation mode appear necessary.

B. DEVELOPMENT OF THE REGIONAL HIGHWAY SYSTEM

1. Highway Development in New England

Although the system of intra-regional highways in New England can be traced to the early 1800's, the most significant benchmark in its development was the passage of the Federal Aid Road Act of 1916. This legislation provided funds for highway construction by the states with the objective being the establishment of a unified and comprehensive system of interstate roads. This system, designated the Federal Aid Primary Highway System by Congress in 1921, constituted the majority of the region's interstate highway routes until the late 1940's. In 1946 the Maine Turnpike Authority financed the first link of the toll road era, which extended from Kittery to Portland. The following year Connecticut used full faith bonding to secure financing of the Wilbur Cross Parkway, paving the way for a controlled access "gateway" to New England from the New York metropolitan area and points west and south (via the existing Merritt Parkway). Financing and construction of toll facilities in the high-population density and recreational areas continued into the mid-1950's. These relatively modern highways offered markedly improved service in terms of both travel time and safety and soon accounted for a significant portion of the long-haul interstate trip market. Up to this time Connecticut, Massachusetts, Maine, and New Hampshire had financed major interstate facilities by revenue bonding, while Rhode Island had used this medium to realize two major bridge crossings.

Congress provided the means to extend modern highway service to all regions of the country with passage of the 1956 Highway Act. For all practical purposes the funding of the Interstate Highway System with its 90% Federal and 10% State basis ended the modern toll road era.

Since 1956 the state highway agencies in New England with some exceptions have concentrated on completion of the rural portion of the Interstate System. In addition to the monies specifically allocated to this highway system, many of the funds for other primary highways have been used to build or rebuild roads to serve the Interstate System.

Exhibit III-1 presents a quantitative summary of highway construction by the region's six state highway departments. This table lists the total miles of rural primary highways which have been built by these agencies since 1934. During the post-depression era of the early 1930's, highway construction in the region averaged close to 400 miles per

EXHIBIT III-1

Rural Highway Construction Trends of New England
1934-1965

Year	Miles of State Rural Primary Highways Constructed	Year	Miles of State Rural Primary Highways Constructed
1934	425	1950	295
1935	358	1951	325
1936	369	1952	370
1937	305	1953	427
1938	254	1954	394
1939	252	1955	343
1940	296	1956	379
1941	384	1957	453
1942	281	1958	426
1943	109	1959	415
1944	92	1960	371
1945	40	1961	408
1946	95	1962	301
1947	137	1963	356
1948	417	1964	305
1949	335	1965	206

Source: U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics, Summary to 1965, March 1967.

year, but gradually tapered off to a low of 40 miles toward the end of World War II. Highway activity quickly assumed pre-war dimensions as the nation converted to a peacetime economy. In the mid-1960's, the total miles of rural primary highway built in the region has shown a constant and marked drop to a low of 206 miles in 1965. This recent trend is indicative of several interacting relationships. First, there has been a pronounced long-term increase in the per-mile cost of primary highways. Maine, for example, has estimated that the cost of building a new highway on the Federal Aid Primary System has risen from $80,000 per mile to $220,000 per mile from 1950 to 1965 (a 175% increase). The emphasis on "quality" has been chiefly responsible for this dramatic cost rise during this 15-year period. The appeal of travel on multi-lane, grade-separated, controlled-access highways has been universal and has an effect on the design of two-lane facilities. The search for increased safety and highway beautification has also been a significant factor in increasing costs. Finally, in the most recent few years, the unit cost of labor and materials has dramatically increased.

Some of the decrease in rural mileage construction may be related to factors other than construction cost. For example, the mileage of state administered highway systems has increased by 100% since 1925 and has been accompanied by a broadened scope of responsibility. Maintenance has been a continually increasing financial drain. The annual cost of maintaining highways on the region's State Highway Systems has risen from $2,100 in 1950 to just under $4,000 per mile in 1965.

An historical summary of funds spent for construction and maintenance of state-administered highways is shown in Exhibit III-2. A detailed discussion of the financial aspects of highway development appears later in the chapter, but at this juncture a brief review of the levels of investment in state highways is helpful in establishing the financial framework of current operations.

Prior to World War II the region spent in the order of $50 million per year to build and maintain the state highway network. Road investments rose rapidly in the late 1950's and have continued to mount to the present level of half a billion dollars per year. Maintenance of the 25,000-mile web of state highways reached the $100 million plateau in 1965, and this is more money than the region invested in construction in 1950.

2. <u>Extent of Highway System</u>

There are approximately 100,000 miles of streets and

EXHIBIT III-2

Comparison of Construction and Maintenance Expenditures,
State Administered Highways of New England, 1925-1965
(In Thousands of Dollars)

YEAR	CONNECTICUT		MAINE		MASSACHUSETTS		NEW HAMPSHIRE		RHODE ISLAND		VERMONT		N. E. REGION		TOTAL
	Const.	Maint.	Const.	Maint.	Const.	Maint.	Const.	Maint.	Const.	Maint.	Const.	Maint.	Const.	Maint.	
1925	3,727	3,392	4,080	1,685	8,317	1,304	1,674	2,128	845	1,507	1,853	1,536	20,496	11,552	32,048
1930	11,261	2,857	10,004	3,125	12,497	3,076	2,917	5,927	1,614	904	6,286	1,750	44,579	17,639	62,218
1935	9,824	3,198	4,595	3,414	10,457	5,123	2,040	2,485	1,664	836	1,649	1,021	30,229	16,077	46,306
1940	11,262	3,296	4,180	4,055	6,215	4,501	2,999	2,674	1,740	1,041	2,460	1,420	28,856	16,987	45,843
1945	2,597	4,702	652	6,020	1,357	5,889	681	3,004	1,155	1,603	271	1,480	6,713	22,698	29,411
1950	15,326	7,251	10,572	7,999	52,641	22,740	5,834	4,433	817	1,961	2,562	3,351	87,752	47,735	135,487
1955	46,403	12,190	42,319	10,920	131,975	19,732	16,181	6,178	12,944	3,296	5,906	4,191	255,728	56,507	312,235
1960	82,602	19,352	32,349	14,663	120,802	24,558	29,434	8,259	19,759	5,651	24,792	5,866	309,738	78,349	388,087
1965	129,781	22,116	41,512	17,471	127,848	34,370	26,452	10,914	46,140	6,496	32,870	6,833	404,603	98,200	502,803

Source: U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics, Summary to 1965, March 1967.

highways in New England (see Exhibit III-3), of which 91% are surfaced and improved facilities. Massachusetts and Maine account for nearly 50% of the entire network mileage (see Exhibit III-3) with 27,000 and 21,000 miles, respectively. Rhode Island has the smallest system with 4,600 miles. The rationale of Federal Aid for highways becomes quite evident with a quick perusal of the mileage and population comparison in Exhibit III-3. Maine, for example, with but 9% of the region's population must contend with 21% of the region's highway mileage. It is this kind of disparity between available financial resources and the extent of the physical environment, coupled with the objective of a comprehensive and continuous Interstate System, which led to the creation of a Federal-State partnership in 1916 and its further strengthening in the ensuing years. In comparison with other sections of the country, New England has fewer miles of highways per capita (see Exhibit III-4). This, of course, results from the region's relative geographic compactness and its highly urbanized population distribution.

With 76% of its population in urban places, New England ranks second to the Middle Atlantic region, and this characteristic is reflected in the proportion of the street and highway plant which is urban. Over 40% (see Exhibits III 5 & 5a) of the total highway network is located within urban environments, and this is twice as much as the nearest region (Middle Atlantic with 21% - see Exhibit III-6). Within New England a clear division exists between the southern and northern three states. Connecticut, Massachusetts, and Rhode Island classify 71% to 82% of their mileage in urban areas, while the comparable figure in Maine, New Hampshire, and Vermont ranges from 7% to 12%.

3. Physical Characteristics

Comparable data describing a few basic physical characteristics of the region's major streets and highways have been compiled and appear in Exhibit III-7. Approximately 12,600 miles of the region's total 100,000 network are represented.

The physical quality and width of a highway's pavement are frequently used as barometers of its relative sufficiency in terms of modern design standards.

Fifty-eight (58%) percent of the region's primary rural highways have high-quality pavement, as compared with 65% for the nation. This difference is especially significant,

EXHIBIT III-3

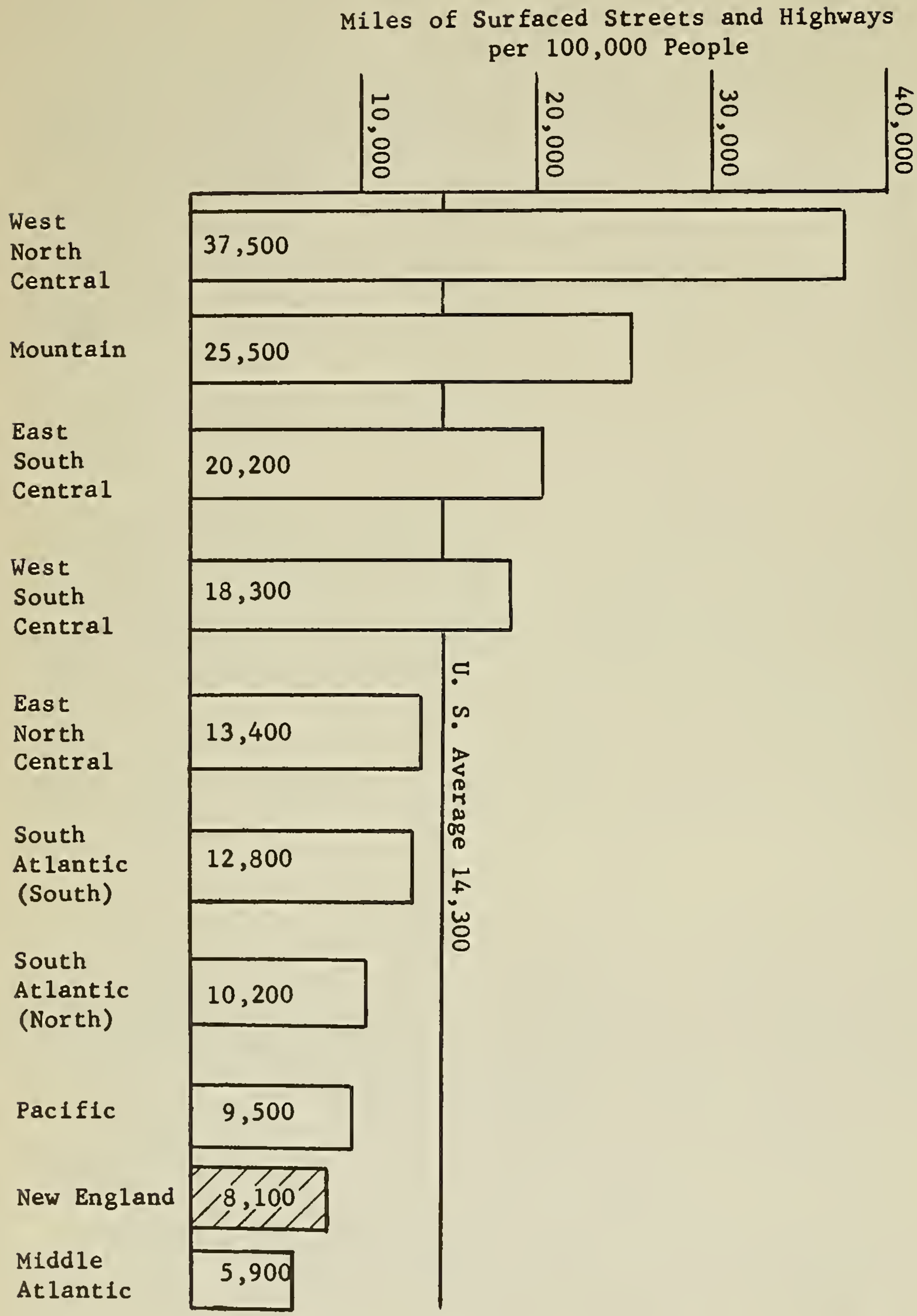
Regional Highway Mileage vs. Population of New England, 1965

Area	Total Miles of Streets and Highways	Percent of Region	Total Population (x 1,000)	Percent of Region
Connecticut	17,672	17.9	2,833	25.4
Massachusetts	27,089	27.4	5,349	48.1
Rhode Island	4,644	4.7	891	8.0
Maine	21,081	21.4	993	8.9
New Hampshire	14,459	14.6	669	6.0
Vermont	13,781	14.0	397	3.6
N. E. Region	98,726	100.0	11,132	100.0

Source: U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1965, April 1967.

EXHIBIT III-4

Comparison of Highway Mileage in Various Regions of the United States



Source: U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1965, April 1967.

EXHIBIT III-5

New England Highways,
Urban vs. Rural Mileage,
1965

Area	Total Miles of Streets and Highways[1]	Total Land Area (Sq. Mi.)[2]	Miles of Streets and Highways Per Sq. Mi. of Area	Percent Urban Mileage
Connecticut	17,672	5,009	3.5	71
Massachusetts	27,089	8,257	3.3	73
Rhode Island	4,644	1,214	3.8	82
Maine	21,081	31,012	0.7	12
New Hampshire	14,459	9,014	1.6	11
Vermont	13,781	9,609	1.4	7
N.E. Region	98,726	64,115	1.5	41

Sources: 1/ U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1965 April 1967.

2/ U.S. Department of Commerce, Statistical Abstract of the U.S., 88th Annual Edition, July 1967.

EXHIBIT III-5a

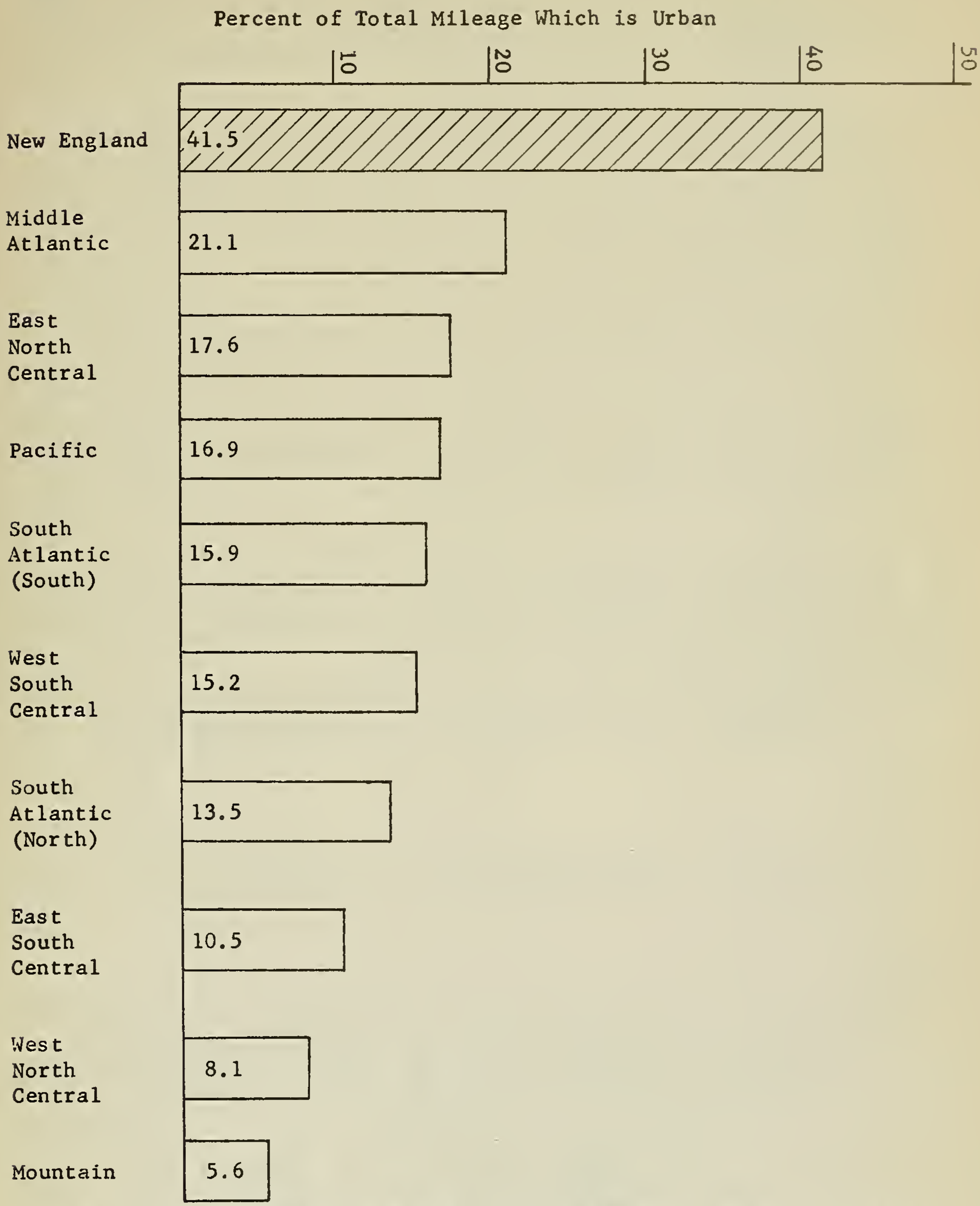
Comparison of Miles of Railroad and
Miles of Streets and Highways per 1,000 Population
and per Square Mile in the New England States

State	Miles of R.R.	Miles of Streets & Highways	Total Pop. 1965 (000)	Miles of R.R. per 1,000 Pop.	Miles of Highway per 1,000 Pop.	Land Area (Sq. Mi.)	Miles of R.R. per Sq. Mi.	Miles of Sts. & Highways per Sq. Mi.
Maine	1,785	21,081	993	1.79	21.22	31,012	0.1	0.7
New Hampshire	827	14,459	669	1.23	21.61	9,014	0.1	1.6
Vermont	798	13,781	397	2.01	34.71	9,609	0.1	1.4
Massachusetts	1,573	27,089	5,349	0.29	5.06	8,257	0.2	3.3
Rhode Island	156	4,644	891	0.17	5.21	1,214	0.1	3.8
Connecticut	735	17,672	2,833	0.25	6.23	5,009	0.1	3.5

Sources: Interstate Commerce Commission, Transport Statistics in the United States, Washington, D.C. 1966; U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1965, April 1967; U.S. Department of Commerce, Statistical Abstract of the U.S., 88th Annual Edition, July 1967.

EXHIBIT III-6

Comparison of Urban Street Systems in Various Regions of the United States



Source: U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1965.

EXHIBIT III-7

Characteristics of State Primary Highway Systems of New England, 1965

Area	Total Surfaced Miles	% With High Type Pavement	% Having Width of Under 20'	20-47'	Over 48'	% With 2 Lanes	3 Lanes	4 Lanes Undivided	4+ Lanes Divided
Urban									
Connecticut	906	N.A.	4	51	45	47	-	6	47
Maine	384	N.A.	5	80	15	93	-	2	5
Massachusetts	1,801	N.A.	3	69	28	33	24	15	28
New Hampshire	223	N.A.	9	75	16	86	-	4	10
Rhode Island	715	N.A.	25	63	12	70	-	17	13
Vermont	73	N.A.	25	64	11	89	-	-	11
N.E. Region	4,102	N.A.	8	65	27	52	11	11	26
U.S.A.	50,951	N.A.	8	64	28	62	3	16	19
Rural									
Connecticut	331	83	8	78	14	79	-	1	20
Maine	3,297	58	37	60	3	96	1	-	3
Massachusetts	773	89	11	66	23	61	19	9	11
New Hampshire	1,691	34	7	85	8	91	1	-	8
Rhode Island	269	69	39	58	3	89	-	7	6
Vermont	2,130	62	15	81	4	95	-	-	5
N.E. Region	8,491	58	22	71	7	97	2	1	6
U.S.A.	409,945	65	20	74	6	91	1	1	7

Source: U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1965, April 1967.

since the region's weather pressures are particularly severe. Among the states, New Hampshire has the smallest proportion (34%) of high quality surfaces, and this is substantially below the next ranked state (Maine, with 58%). Both Massachusetts and Connecticut have high type pavements on most (89% and 83%, respectively) of their main rural facilities.

Pavement widths were grouped in three classes, selected to point up the proportions of the system having very narrow (under 20 feet) and very wide (over 48 feet) surfaces. The results for the region show a close similarity to national averages, but wide variations among the states in the region. In urban areas, for example, Massachusetts counts only 3% of its major streets under the critical 20-foot width, while the comparable figure for both Rhode Island and Vermont is 25%. Two-way operation is not practical on a city street which is under 20 feet wide. The higher travel speeds in rural areas require more roadway width, and modern design standards suggest a minimum pavement width of 24 feet (two 12-foot lanes). Surprisingly enough, a much larger portion of the rural highways are under 20 feet wide (22%). Even though a portion of these narrow rural highways undoubtedly carry very light traffic, a definite hazard remains.

About 37% of the state primary urban streets in New England have four or more lanes as compared to 35% for the country-wide average. It should be kept in mind that these data only include facilities on the State Primary System, and thus represent about 8% of all urban streets. In general, the pattern follows that of width data, with Connecticut and Massachusetts having substantially larger segments of multi-lane roads.

4. Highway Systems

In describing the highway network, continual reference to various "systems" will be made, and it is useful at this point to define terminology and discuss briefly the nature of these systems.

Each state has designated a primary state highway system which has as its basic function the intra-state connection of centers of population, industry, and commerce. These six state highway systems in New England have both urban and rural components and amount to some 12,500 miles of major facilities. The bulk of Federal and State funds spent are allocated for the maintenance and improvement of these roads, and they consequently exhibit more modern design standards and a better quality of maintenance than the balance of the mileage. In addition to this primary network, three states

(Maine, Connecticut, and New Hampshire) have defined a state secondary system originally for the purpose of providing farm-to-market access and highway service to the smaller population centers. From a mileage standpoint, these "second level" systems are more extensive in each of the three states which have them, but a relatively small (but not insignificant) percentage of state funds are spent on their maintenance and improvement.

Two Federal highway systems are superimposed on these state highway networks. It should be emphasized that most (but not all) of the Federal system mileage is a part of a state primary highway network. These Federal systems are administrative in nature, since they only define those highway routes which are eligible for Federal funds. In fact, however, the relative magnitude of Federal funds and their accompanying design requirements have resulted in the Federal Aid systems developing as the most modern facilities.

The first and most important Federal network is the Federal Aid Primary System (FAP). This system, limited in length to 7% of the total rural mileage existing in each state in 1921, has been financed on two different Federal-State formulae. The older portion of the FAP system was and is eligible for Federal aid on a 50-50 basis with the Interstate System (part of the FAP) being built with 90% Federal and 10% State funds. The limitation on the system length has led to some shifting of locations as the states have felt a need to respond to the pressure of changing traffic patterns.

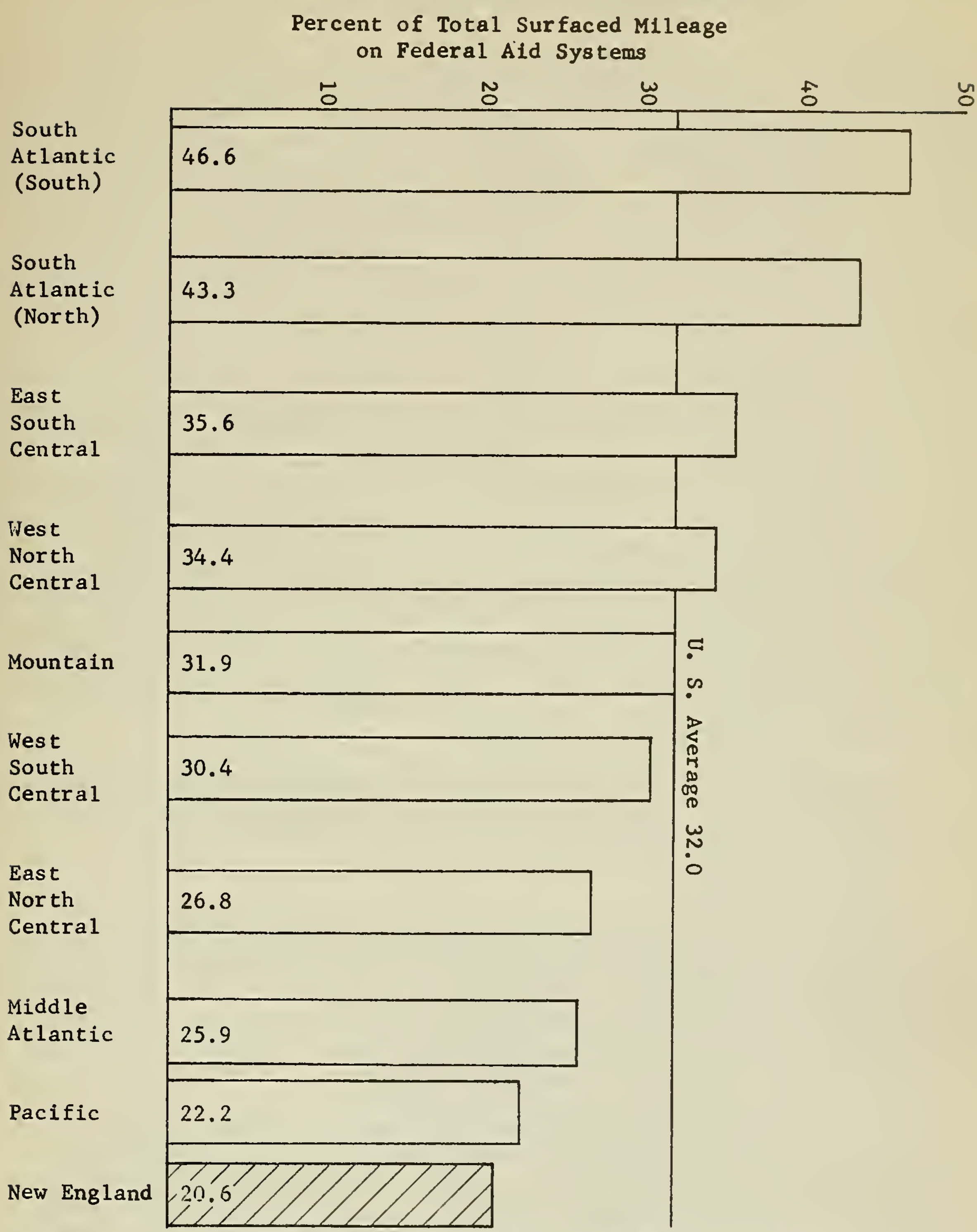
In 1936, Congress authorized the use of Federal funds for improvement of secondary roads, and these were used until 1944 without restriction as to facility location. In that year a Federal Aid Secondary Highway System (FAS) was officially designated, and thereafter use of secondary funds was limited to these facilities.

With only 21% of its surfaced mileage on a Federal Aid system, New England has relatively fewer miles than any region in the country (see Exhibit III-8). This has occurred for two reasons:

(1) Since mileage of the FAP system is limited to a fixed percent of total miles, New England with its relatively compact and small highway networks qualified for a proportionately small segment of the available FAP mileage.

EXHIBIT III-8

Comparison of Extent of Federal Aid Systems
in Various Regions of the United States



Source: U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1965, April 1967.

(2) FAS mileage has no mileage limitations, and many southern and western states have seen fit to designate very large amounts of their total network.

From an administrative and financial viewpoint, New England has another "highway system" which in reality is not a system in the true sense of the word. These roads are the toll facilities largely built in the 1940's and early 1950's before the advent of 90% Federal subsidization of the Interstate System (1956). There are over 500 miles of toll facilities in the region, not including toll bridges or ferry routes. For the most part, these highways exhibit modern design standards (the Merritt Parkway is an exception) although they differ in some respects from the exacting standards of the Interstate System. Approximately 300 miles of the toll routes were incorporated into the Interstate System in 1957. Together with free portions of the Interstate System which were completed prior to 1956, the Region has a substantial investment in Interstate Highways which did not involve the financial participation of the Federal Government. While Congress expressed its intent to answer the question of Federal reimbursement for these highways in the 1956 Highway Act, no action has been taken yet, and the most recent report to Congress by the Department of Transportation (1968 Highway Needs Report) suggested that the "decision can be deferred without difficulty until the end of the current Interstate Program (6 years or so away)". New England has an obviously large stake in this decision and should press for an equitable reimbursement formula.

A summary of total and system mileages by state appears in Exhibit III-9. Maps III-1 and III-2 show the FAP Systems.

5. Travel Volumes

Each state in the region maintains a comprehensive and continuing traffic census to provide trend information for the planning process and to serve as direct inputs to design and operating analyses. These data also form the basis for nationwide travel information published by the U. S. Department of Transportation. A state-by-state breakdown of some of these data appears in Exhibit III-10.

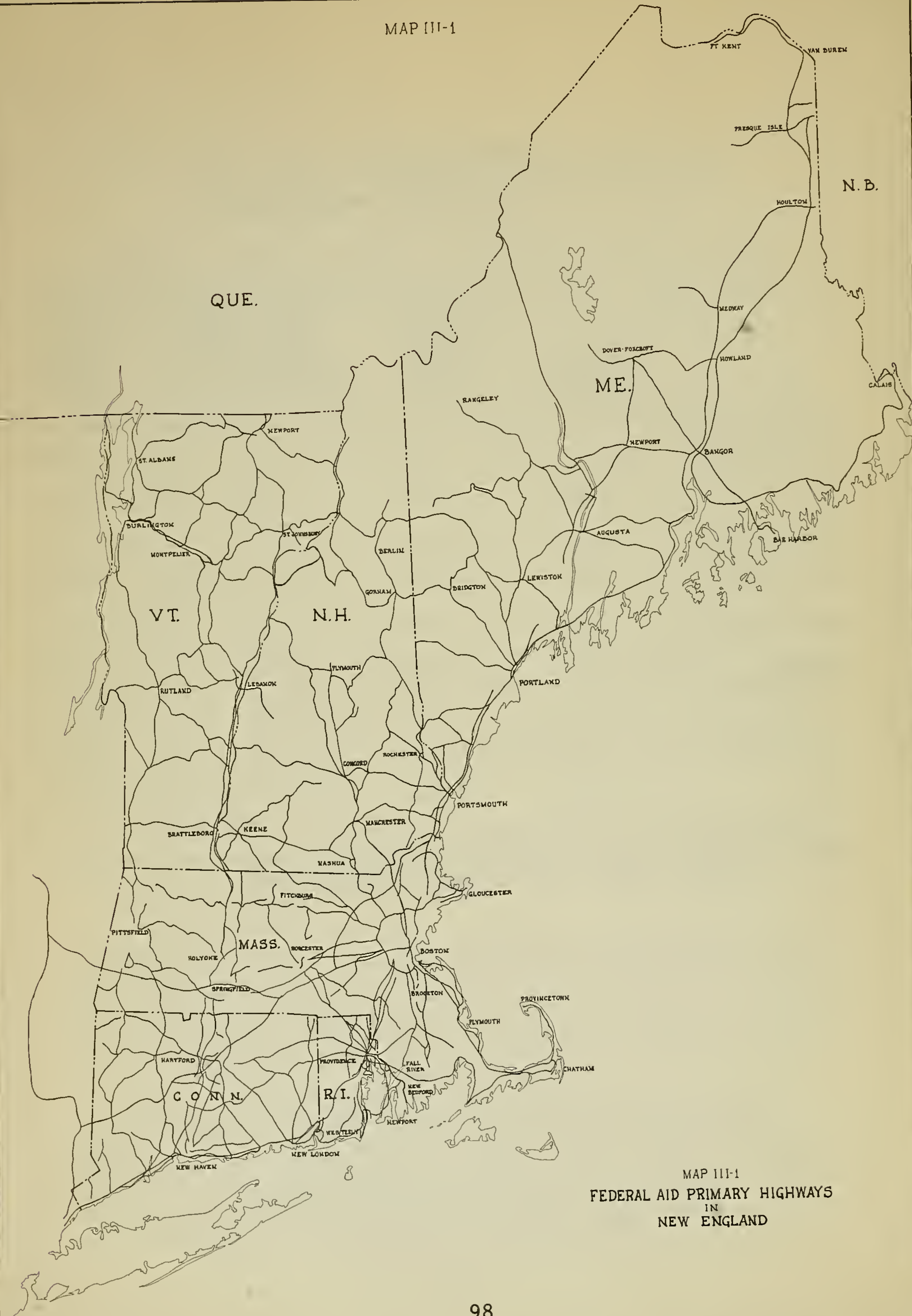
Travel characteristics for the region differ in some respects from the national averages, and it is helpful to discuss them in some detail. First, there is a wide gap in the distribution of travel volumes in urban and rural environments. Just under one half (49%) of all highway travel in the United States takes place inside urban areas as contrasted with 63% for the New England Region. In spite

EXHIBIT III-9

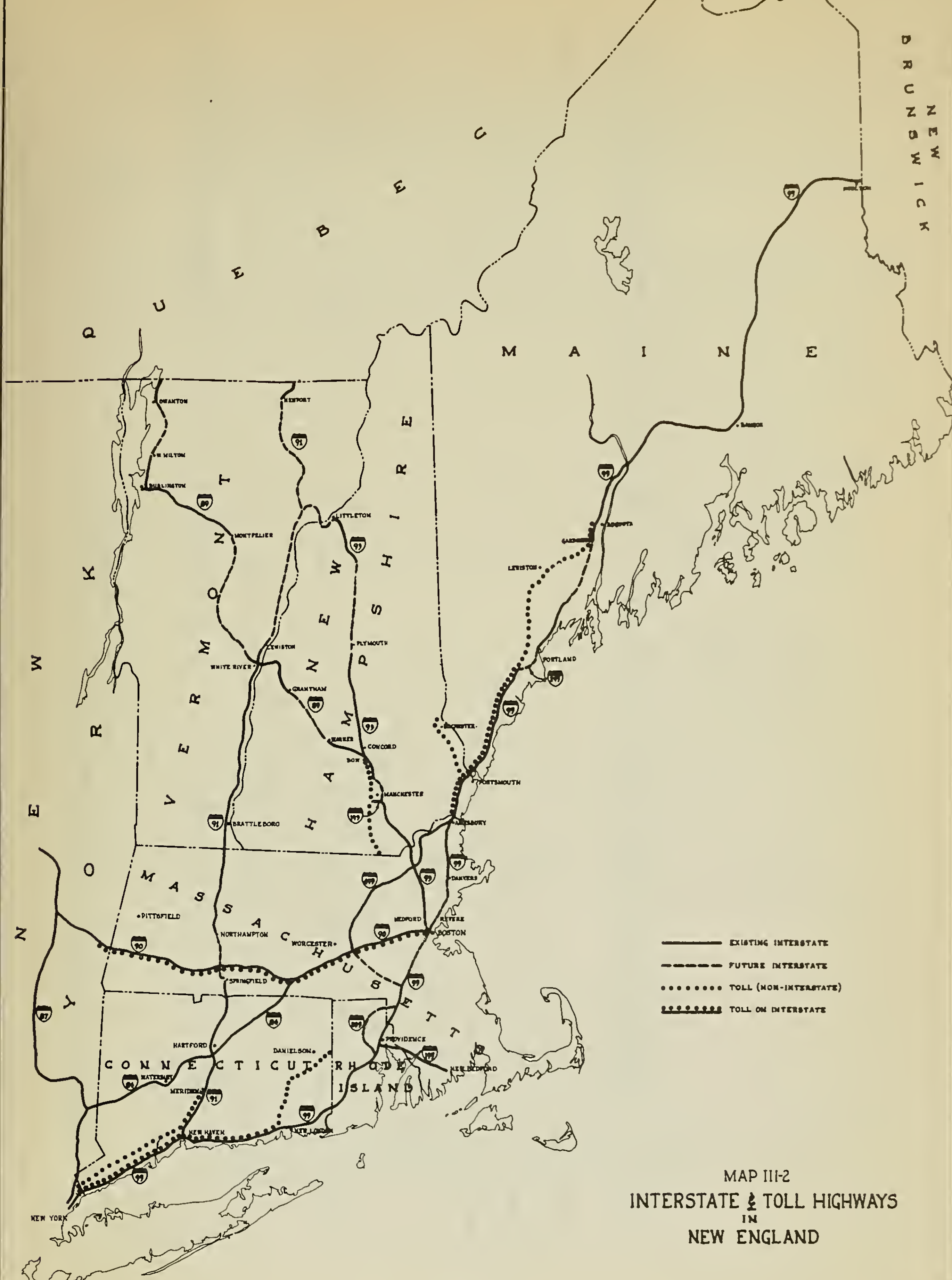
Summary of New England Highway System Mileages, 1965

Area	Total Miles of Streets and Highways	Total Miles on State Primary System	Total Miles on Federal Aid Primary System: Interstate System	Total Miles on Federal Aid Primary System: Other	Total Miles on Federal Aid Secondary System
Connecticut	17,672	1,237	272	964	1,230
Maine	21,081	3,681	318	1,562	2,477
Massachusetts	27,089	2,574	405	1,877	2,283
New Hampshire	14,459	1,914	198	1,039	1,666
Rhode Island	4,644	984	70	396	484
Vermont	13,781	2,203	338	997	1,886
N.E. Region	98,726	12,593	1,601	6,835	10,026
U.S.A.	3,689,666	464,944	41,320	209,489	631,407

Source: U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1965.



MAP III-1
FEDERAL AID PRIMARY HIGHWAYS
IN
NEW ENGLAND



MAP III-2
INTERSTATE & TOLL HIGHWAYS
IN
NEW ENGLAND

EXHIBIT III-10

Summary of New England Highway Travel Volume,
1965
(Millions of Vehicle Miles)

Area	Federal Aid Systems			Other State Adm. Rds.			Local Facilities			All Highways		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Connecticut	4,224	2,884	7,108	2,537	428	2,965	2,766	161	2,927	9,527	3,473	13,000
Maine	665	2,577	3,242	284	743	1,027	338	238	576	1,287	3,558	4,845
Massachusetts	8,278	5,085	13,363	1,208	158	1,366	5,737	835	6,572	15,223	6,078	21,301
New Hampshire	506	2,010	2,516	59	237	296	401	262	663	966	2,509	3,475
Rhode Island	1,567	780	2,347	146	70	216	1,236	18	1,254	2,949	868	3,817
Vermont	218	1,361	1,579	*	7	7	198	188	386	416	1,556	1,972
N. E. Region	15,458	14,697	30,155	4,234	1,643	5,877	10,676	1,702	12,378	30,368	18,042	48,410
U. S. A.	211,939	361,215	573,154	21,622	13,925	35,547	199,992	79,119	279,111	433,553	454,259	887,812

* Less than 0.5 million vehicle miles of travel.

Source: U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Public Roads Journal, February 1968.

of the area's advanced urbanization, this is somewhat unexpected, particularly when one considers the much lower rate of vehicle ownership in the large urban centers, along with the corresponding use of public transportation facilities. It is likely that the smaller urban places, where these factors are not present, account for a significant part of the urban travel.

Overall 62% of all highway travel in New England occurs on the Federal Aid systems, and while this is not dramatically lower than the corresponding 65% nationwide average, only two regions (Middle Atlantic and Pacific) have lower percentages. The three regions together account for over one-third of all travel in the United States, and thus influence the averages to a considerable degree. The Federal systems serve a smaller portion of the total travel in the more urbanized areas, and this is evident both inside the region and in other parts of the country (see Exhibit III-11). Eighty (80%) percent of highway travel in Vermont, for example, is on the Federal System, while the comparable figure is 55% for the highly urbanized state of Connecticut. The urban portions of the Federal Aid Systems handle a much smaller segment of total urban travel when compared to the rural situation (81% for rural, 51% for urban).

The Federal systems in New England are used more intensively than any other section of the country (see Exhibit III-12). In 1965 these 18,000 miles of streets and highways served almost 4,500 vehicles every day, and this is more than 18% higher than the next closest region (Middle Atlantic) and 150% more than the nationwide average. The three southern and urbanized New England states had average daily traffic volumes ranging up to 8,000 vehicles, while the northern three states had much lower average volumes in the 1400 to 2400 vehicle per day range. Urban volumes on the FAP system average 10,100 vehicles per day, while the rural portions carry 3,100 vehicles. Traffic volumes on the Federal Aid Interstate (FAI) system, the toll facilities, and other significant regional highways are graphically depicted on Map III-3.

Several pertinent conclusions reached from the broad discussion of highway travel in the region are:

(1) A substantial majority (62%) of highway travel takes place in urban environments.

(2) All six states have considerable amounts of urban travel, although the proportion varies between the northern and southern three states.

EXHIBIT III-11

Travel Volume Comparison of the New England States and Other Regions
Federal Aid System vs. Other Facilities

Area	Vehicle Miles of Travel (In Millions)	% of Total Travel on Federal Aid Systems	% of Total Urban Travel on Federal Aid Systems
Connecticut	13,000	55	44
Maine	4,845	67	52
Massachusetts	21,301	63	39
New Hampshire	3,475	72	52
Rhode Island	3,817	61	53
Vermont	1,972	80	52
New England Region	48,410	62	51
Middle Atlantic	139,175	55	48
So. Atlantic (north)	49,163	75	65
So. Atlantic (south)	83,615	72	49
East North Central	178,575	64	46
West North Central	79,578	68	42
East South Central	53,987	73	50
West South Central	88,625	70	52
Mountain	41,888	72	53
Pacific	121,627	55	49
United States	887,812	65	49

Source: U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Public Roads Journal, February 1968.

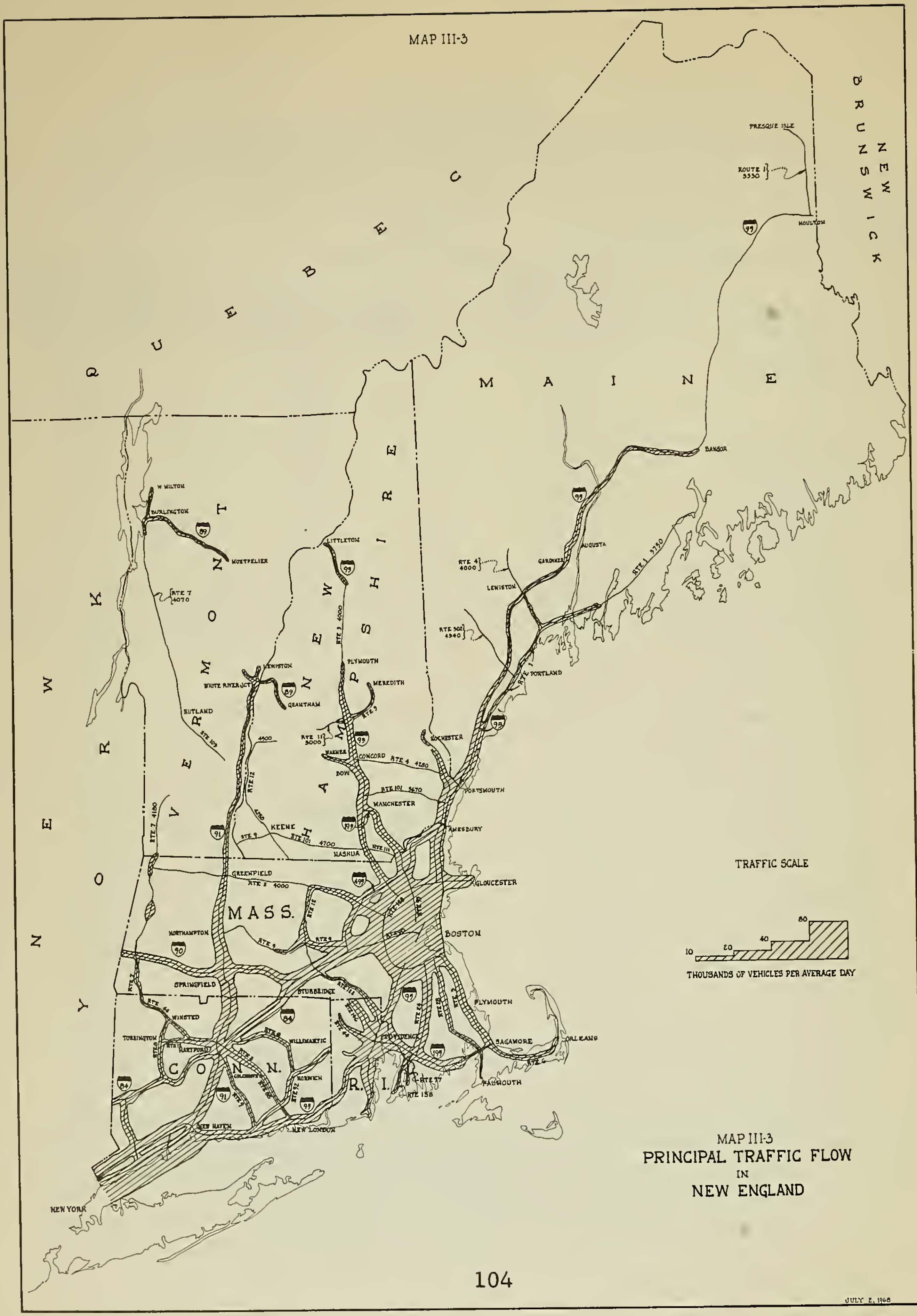
EXHIBIT III-12

Comparison of Travel on Federal Aid Highway Systems
of the New England States and Other Regions
1965

Area	Vehicle Miles of Travel 1/ (In Millions)	Total Federal Aid Systems Mileage 2/	Average Daily Traffic Volume (F.A. Systems)
Connecticut	7,108	2,466	7,900
Maine	3,242	4,357	2,040
Massachusetts	13,363	4,565	8,020
New Hampshire	2,516	2,903	2,380
Rhode Island	2,347	950	6,770
Vermont	1,579	3,221	1,340
New England Region	30,155	18,462	4,470
Middle Atlantic	76,687	55,260	3,800
So. Atlantic (north)	36,789	49,154	2,050
So. Atlantic (south)	60,159	105,159	1,570
East North Central	114,219	136,895	2,280
East South Central	54,216	205,259	720
West North Central	39,191	89,741	1,200
West South Central	62,179	163,204	1,650
Mountain	30,288	63,299	1,310
Pacific	67,479	49,658	3,720
United States	573,154	880,601	1,780

Source: 1/ U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Public Roads Journal, February 1968.

2/ U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1965.



MAP III-3
PRINCIPAL TRAFFIC FLOW
IN
NEW ENGLAND

(3) The region uses its Federal highway systems more intensively than <u>any</u> other part of the country.

(4) The region suffers more traffic congestion, particularly in urban environments, than other sections of the country.

6. <u>Inventory of Traffic Data</u>

All six New England state highway departments maintain extensive and continuing data collection programs directed towards the following goals:

(1) Definition of current travel volumes.

(2) Definition of hourly, daily, and seasonal flow variations.

(3) Definition of travel patterns.

(4) Physical descriptions of the highway plant.

Less comprehensive data programs regularly sample such variables as:

(1) Traffic speed

(2) Traffic composition (vehicle types)

(3) Truck weights

All of these data are vital to the successful and efficient operation of the extensive highway networks, but the information most important in the initial evaluation and planning of new facilities is traffic volume and travel patterns. The available fund of volume information is complete and provides current travel density on most links of the state and regional highway facilities as well as hourly, daily, and seasonal trends. This is not the case with travel pattern data. Substantial gaps in the information are evident, and much work would be required to reorganize those data which are available in the six states. A quantitative picture of intrastate and interstate trip movements would be absolutely essential in the evaluation and planning of any extensive new facilities such as the proposed Northern New England East-West Highway. The emphasis in this field has been in urban areas during the last ten years; and most urban areas of 50,000, and many smaller ones, have had comprehensive transportation studies. This information is available for use. In the past few years several of the

states - notably Maine, Connecticut, and Rhode Island - have begun the task of collecting origin-destination data on a statewide basis. Vermont has nearly completed a statewide border crossing study, but this was limited to out-of-state vehicles.

7. Recent Developments

Since 1956, the construction of the Interstate Highway System has dominated the field both within the region and nationally. In the four-year period of 1962-1965, for example, interstate contract awards amounted to about $640 million - nearly 57% of all State Highway Contracts in the region. With some exceptions, early emphasis was on the rural portions of the system, and much of this modern high-speed rural network is now open to traffic. Progress on the urban segments of the interstate has been much slower, and many difficult problems remain. It is clear that the system will not be completed by the original 1972 deadline, and both national and international situations will have an effect on the completion date; but in the meantime, the various states have already begun the process of detailing highway needs in the 1970's and 1980's. Early estimates for the region suggest highway needs of close to $1 billion per year in the late 1970's and early 1980's. While a formal definition of program emphasis is not available for each state, personal discussions with highway planning officials in the region produced two persistent themes:

(1) Due to the recent emphasis on Interstate Systems, there is a backlog of work to be done on the other rural primary roads.

(2) Successful treatment of the region's urban circulation problems will require an increase in the level of funding from state highway departments.

There have been three major emphasis shifts in transportation programming on the Federal level recently which are important and worthy of a short review. These program areas are: highway safety, public transportation, and traffic engineering.

In the face of a rapidly growing traffic safety problem, Congress passed legislation in 1966 which directed the Federal Government to prepare traffic safety program standards and authorized the expenditure of substantial funds through the states (on a 50-50 basis) to implement and/or expand activities in this field. Among the standards which have been published, four bear directly on the highway program. They are: Identification and Surveillance of Accident Locations; Traffic Records; Highway Design, Construction,

and Maintenance; and Traffic Control Devices. Funding of these safety programs has been at a level far below that authorized by the original Act, and this has curtailed activity by the states to some extent. In the early stages, however, the emphasis has rightly been placed on inventory, study, and evaluation. The creation of an efficient method of locating accidents on the extensive state highway system, for example, is an essential preliminary element to many operating and research programs, since it provides the means of identifying high-frequency accident locations and evaluating any corrective actions which might be taken. A detailed and current inventory of traffic control devices must be present before these devices can be evaluated against a standard and modernization programs undertaken. Concern over the safety problem is but another reflection of the nation's ever-growing sophistication it its way of life, and in spite of the lack of funds, substantial programs are now underway.

In the public transportation field, a Federal program aimed at improving the quality of existing transit facilities and the expansion of service to meet changes in demands has had its beginnings in the Department of Housing and Urban Development.

In recent months, the program has been transferred to the Department of Transportation by administrative reorganization, and continued progress can be expected. The integration and balancing of public and private transportation in the Boston metropolitan area will benefit much of the New England region by providing improved access to the many cultural, academic, medical, industrial, and recreational centers located there.

In 1967 the Department of Transportation began pilot work on a program (TOPICS) directed at improving the quality of traffic flow on urban arterial streets. The intent is to encourage the use of relatively inexpensive traffic engineering techniques (modern signalization, channelization, parking control, etc.) to increase both capacity and safety. The program is based upon the assumption that the full potential of the existing physical plant is not being utilized. Even though additional funds have not been apportioned for this work and it is thus still in its infancy, it is highly significant for the following reasons:

(1) It recognizes the need to improve urban circulation.

(2) It provides for the expenditure of Federal Highway Funds on facilities which are not on the existing Federal Aid System (FAP, FAI, and FAS).

It is a particularly important concept to the New England region because of its high level of urbanization, the age of its cities, and the accompanying physical and financial difficulties associated with the construction of entirely new facilities.

C. THE FEDERAL-STATE PARTNERSHIP

1. Background

Comprehensive and meaningful participation in a joint Federal-State road building program began with the Federal Aid Road Act of 1916. Aside from establishing a formula for distribution of Federal Funds, the Act stipulated that each state establish a state highway department to receive and use the Federal monies. Since that time, the scope of this Federal-State venture has been enlarged on a national basis to reflect national trends in travel demand and on a regional level in response to special problems of a unique nature or those involving emergency situations. The major benchmarks in this process can be summarized as follows:

1921: (a) Authorization for designation of a SYSTEM of principal and intercounty roads. This system, limited to 7% of the total rural mileage then in existence, became the Federal Aid Primary System (FAP).

(b) Limitation on use of Federal funds to the FAP System.

1933: (c) As an emergency measure, the Federal Aid Program was broadened to include extension of the FAP System into and through municipalities.

1944: (d) Authorization for the use of Federal Aid funds in urban areas.

(e) Portion of Federal funds formally earmarked for urban areas.

(f) Authorization for the designation of Federal Aid Secondary Highway System.

(g) Authorization for the designation of an "Interstate" Highway System.

1956: (h) Creation of Highway Trust Fund.

(i) Provision for funding the Interstate System on a 90-10 Federal-State basis, over a 17-year period.

1962: (j) Authorization for Federal participation in relocation expenses.

1965: (k) Provision for the beautification of Federal Aid Highway System.

(l) Authorization of Appalachian System of Development Highways.

1966: (m) Provision for the creation of program standards in the area of highway safety.

1967: (n) Experimental Traffic Operations Program to Increase Capacity and Safety (TOPICS).

In its original form, the Federal Road Agency was part of the Department of Agriculture, but during its more active history has been housed within the Department of Commerce (Bureau of Public Roads). Presently known as the Federal Highway Administration, it constitutes a major element of the recently established Department of Transportation. Throughout its development, the agency has been the administrative mechanism for interpreting Congressional policy and effectuating programs in the highway field. Functionally, Public Roads has, in partnership with the States, determined the configuration of the major highway systems in the country and promulgated continually improved design standards. It has also taken a significant research role and has promoted substantial advances in the transportation planning process.

During the early period of Federal involvement in highway construction, there was a clear, nationwide need to improve the existing inter-city and inter-regional highway plant. All of the early programs focused on this rural need. It was not until the end of World War II that Federal aid funds were earmarked for urban areas (25% of total), and this represents the first substantive recognition of the urban circulation problem.

The Federal Government has a long history of response to unique and pressing highway problems on both a nationwide and regional basis. The investment in forest development roads, defense highways, and the Appalachian development program are examples of the flexibility of the Federal establishment in recognizing and reacting to highly specialized needs. Traditionally, execution of the highway programs by the Bureau of Public Roads has been through the various state highway departments.

2. The Impact of Federal Aid in New England

The importance of Federal aid in the states' road building programs has grown steadily since its inception some 50 years ago, but was emphasized most dramatically by Congress in 1956 by the establishment of the Federal Highway Trust Fund and the concurrent authorization of 90% Federal funding of the Interstate Highway System. This legislation earmarked specific proportions of highway user taxes, including 100% of the Federal diesel fuel, gasoline, and tread rubber taxes, to the Trust Fund, thereby ensuring its use for highway improvements.

The magnitude of the Federal role in the highway field can best be viewed within a financial framework. The amounts of Federal aid funds spent in the region during the three-year period 1963-1965 appear in Exhibit III-13. It is noted that the figures quoted are those funds administered by the Bureau of Public Roads and, while not all inclusive, represent the great majority of the Federal contribution to highway construction in the region. A three-year period has been used to minimize the effect of the large year-to-year variations which can, and do, occur for a variety of reasons.

The emphasis on the Interstate System is immediately clear from the data. During the three-year period, nearly 80% of the Federal Highway dollars distributed to the region were spent on construction of this 1600-mile system (which represents 1.6% of the region's total street and highway mileage, 8.7% of its Federal Aid Systems' mileage, and 12.7% of the state primary system mileage). While specific data are not available, it is known that a significant portion of the balance of the Federal aid has been required to improve facilities directly feeding the Interstate.

The Interstate System has influenced the highway program in ways which are far less obvious than its own financial requirements. The advantages of travel on these multi-lane, grade-separated facilities are now clear to the motoring public, and there is much pressure to concentrate future programs solely on their enlargement. Furthermore, there has been widespread oversimplification of the relationship between these high-capacity highways and economic development. There can be little doubt that a dependent relationship exists between the quality of transportation service and rate of economic development, but at the same time it is clear that other ingredients of decisive importance are necessary.

The basic patterns of traffic flow have been and will

EXHIBIT III-13

Summary of Federal Highway Funds Spent in New England*
1963 - 1965

(In Millions of Dollars)

Area	Highway System: F.A.P. 3 yrs.	F.A.P. Av.	F.A.S. 3 yrs.	F.A.S. Av.	Urban 3 yrs.	Urban Av.	Interstate 3 yrs.	Interstate Av.	All F.A. Systems 3 yrs.	All F.A. Systems Av.
Connecticut	9.0	3.0	5.3	1.8	13.0	4.3	114.8	38.3	142.1	47.4
Maine	9.8	3.3	6.4	2.1	3.5	1.2	50.7	16.9	70.4	23.5
Massachusetts	12.6	4.2	6.1	2.0	19.7	6.6	189.4	63.1	227.8	75.9
New Hampshire	7.7	2.6	5.1	1.7	1.8	0.6	36.3	12.1	50.8	16.9
Rhode Island	7.2	2.4	5.1	1.7	5.5	1.8	39.4	13.1	57.1	19.0
Vermont	5.5	1.8	4.6	1.5	1.0	0.3	58.7	19.6	69.8	23.2
New England	51.8	17.3	32.6	10.8	44.5	14.8	489.3	163.1	618.0	205.9

*Includes Federal Aid Funds administered by the Bureau of Public Roads.

Source: U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1963, 1964, 1965.

continue to be changed by the Interstate and other freeways in a manner which will exert substantial new pressure on feeder facilities. The pattern changes within the Boston metropolitan area serve to illustrate this point. The existing and proposed freeway system is radial in nature, focusing on the central areas of Boston. Thus these major new highways generally have the same system configuration as the arterial street system of the past. As the freeway system is opened, new and strong traffic demands are placed on the arterial cross-town feeder streets, where little capacity exists. Part of the rapid growth of traffic volumes on Route 128, which circles a large portion of the Boston metropolitan area, is a reflection of this "cross-town" capacity deficit. Comparable situations have developed and will continue to develop in rural areas.

The extent to which Federal funds influence the size of the highway program as a whole is indicated by the fact that 29% of all expenditures by the state highway departments in the region are reimbursed by Federal aid. Since Federal funds are not used for maintenance purposes, the relative magnitude of Federal aid can be better visualized within the context of construction disbursements. Direct Federal aid accounts for 48% of all money spent for construction by the six highway departments, and the total value (i.e., Federal aid plus State matching funds) of capital outlay projects in which Federal aid is involved is approximately 64% of the states' highway construction program.

It should be noted that all of these figures are conservative, due to the fact that several states in the region have used the bonding medium to accelerate their Interstate program, and thus a significant portion of the states' investment during the period studied (1963-1965) qualifies for future Federal reimbursement.

3. Application of Federal Funds

Aside from the obvious domination of the Interstate system of the entire highway program, another facet of the application of Federal Aid in the region stands out. This is the rather large imbalance of funds spent on rural and urban facilities. Exhibit III-14 compares the expenditures of State and Federal funds (capital outlay only) on the urban and rural portions of the Federal Aid Primary System during the 1963-1965 period. Expressed in terms of 1965 travel, the region spent 35% more on rural portions of the Interstate System and 82% more on the rural portions of the other Federal Aid Primary Highways. The comparison of these figures with nationwide averages (Exhibit III-14) is striking. Nationally the state highway departments spent $1.97 and $2.24 for every 100 miles of travel on the urban and rural

EXHIBIT III-14

Comparison of FAP Expenditures, New England and United States
Urban vs. Rural

Area	Amount of Funds Spent Annually 1963-1965 (In Millions of Dollars)				Vehicle Miles of Travel 1965 (In Millions)				FAP Expenditures per Unit of Travel (Dollars per 100 Miles)			
	Interstate		Other FAP Hwys.		Interstate		Other FAP Hwys.		Interstate		Other FAP Hwys.	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Connecticut	47.9	27.8	17.3	24.3	2,051	785	1,438	1,193	2.34	3.54	1.22	2.04
Maine	0.2	17.9	2.0	7.6	124	542	420	1,243	0.16	3.30	0.48	0.61
Massachusetts	43.7	29.0	9.3	16.7	2,067	1,105	4,273	2,384	0.11	2.62	0.22	0.70
New Hampshire	0.4	12.5	0.5	6.6	102	374	323	952	0.39	3.34	0.15	0.69
Rhode Island	30.1	1.4	7.4	2.4	462	98	757	488	6.52	1.43	0.98	0.49
Vermont	0.3	21.2	0.5	4.2	82	323	119	643	0.37	6.56	0.42	0.65
N.E. Region	122.6	109.8	37.0	61.8	4,888	3,227	7,330	6,903	2.51	3.40	0.50	0.91
United States	1,378.8	1,747.1	711.7	1,276.3	69,975	77,851	101,581	165,885	1.97	2.24	0.70	0.77

Note: Includes total funds spent by state highway departments for capital improvements to Federal Aid Primary System.

Source: U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads, Highway Statistics/1963, 1964, 1965.

portions of the Interstate System respectively; capital outlays on the other FAP highways were $0.70 and $0.77, and in both cases, the division is in greater balance than in the New England region. In reality, the gulf between rural and urban investments of Federal highway dollars in the region is even wider than depicted by these values. In most of the six states, the bulk of maintenance costs for the Federal aid highways are borne by the local communities while rural maintenance is performed by the State Highway Departments. Further, the capital cost of providing each unit of urban capacity is substantially greater than the rural cost even though urban facilities are designed for larger traffic volumes per lane (larger design volumes are possible on urban facilities because of the lower speed levels).

This emphasis on rural construction has long-standing roots and, even though the Interstate System is theoretically designed on a needs basis, the urban areas in the region have such a backlog of difficult circulation problems that a calculated reassessment of urban-rural programs is in order. On a national level, the Department of Transportation is now engaged in just such an appraisal; and while recommendations have not been presented to Congress, DOT's recent Congressional Report suggests a recognition of the need to improve urban circulation. Nevertheless, the commitment to complete the Interstate System, the continuing high level of military expenditures, and the needs in other program areas suggest that it will be some time before any substantial amounts of Federal money will be available to cope with urban circulation needs on a national basis.

D. HIGHWAY TRANSPORTATION FOR HIRE

1. The Trucking Industry

a. Regulation and the Market Place

Of all the modes of transportation, the motor carrier industry has the most complex structure and is characterized by numerous small companies competing with each other and with medium to large operators. The common carriers compete with trucking operations run by individual shippers and with contract carriers which specialize in the transportation of one or only a small number of commodities. While the trucking industry is regulated, its regulation is substantially different from that of railroads or airlines.[1] In general, motor carriers have somewhat greater freedom of

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[1] H. E. Bixler, "A Psychoanalytical View of the Interstate Commerce Act," Traffic World, Sept. 4, 1965.

entry and complete freedom of exit. Price competition with other modes is seriously complicated by the radically different cost structure of motor carriers from that of railroads. Since their marginal cost is much closer to full cost than that of railroads, they plead for protection from rate reductions. In addition, price competition between motor carriers is limited by motor rate bureaus which are associations of regulated motor carriers established primarily for self-regulation of rates. This is not true of unregulated carriers whose rates are generally lower.2/

The motor carrier industry divides into two major groups, regulated and unregulated. The regulated group includes common carriers, with a certificate of public convenience and necessity granted by either an individual state, the Interstate Commerce Commission, or both, and contract carriers, those with specific contracts to carry specific freight at agreed-upon prices for individual manufacturers. Contract carriers are limited to carrying freight for those with whom they have contracts and cannot solicit general freight. Traditionally the contract carrier serves only one firm, but he may serve several firms for the same type of business requiring similar kinds of specialized equipment and similar services. Contract carriers are subject to all normal licensing and safety regulations imposed by the ICC and/or by the states.

The unregulated group includes private trucking and exempt carriers. Private truck fleets are owned and operated by individual manufacturers solely for the purpose of transporting their own raw materials and products. These truck fleets cannot be used to haul goods for anyone except the owner. Exempt carriers are for-hire truckers hauling commodities which are exempt from economic regulation under the Motor Carrier Act - i.e., non-processed agricultural and horticultural products and fish. Truckers may hold themselves out as carriers of these exempt commodities only and remain exempt carriers, or a regulated common carrier may haul these commodities part of the time and still benefit from the exempt status of the commodities. Because there is no regulation as to rates for agricultural and horticultural products and fish, rates on these commodities are kept low by the competition of numerous small trucking companies participating in the business, each with low overhead costs. In addition, rates are forced down by common carriers of various types hauling agricultural commodities as a back-haul for the normal flow of their regulated traffic.

2/ J. C. Nelson, "The Effects of Entry Control in Surface Transport," Transportation Economics, New York, Columbia University Press, 1965.

Regulated common carriers provide service to customers after obtaining from regulatory authorities various kinds of operating rights. Carriers which serve New England may be described in one or more of the following ways: A regular route common carrier is one which operates over a definite route between specific points with fixed termini on regular schedules and in most instances hauls general commodities. An irregular route common carrier is one which serves points within a given area, but the routes and schedules are not definitely specified. While many of these carriers give service on general commodities, a large number handle only specific kinds of freight, such as cement, petroleum, or steel products. Regular route common carriers must have interstate certificates issued by the ICC in order to perform transportation between states, whereas an intrastate certificate only allows a trucking company to perform service within a state. For an intra-state carrier to handle any freight originating or destined outside the state he must have a certificate registered with the ICC. The effect of these regulations is to put limits on freedom of entry. As a consequence, these certificates providing rights to operate over public highways have definite monetary values, not specified by law, but which in actual fact are traded on a demand and supply price basis. The result of this regulation upon the customer is to increase his transportation costs. In a state or an area where there is an ample amount of freight available for motor carriage and a limited supply of certificates issued by the state regulatory authorities, there is created an artificially high market price for the certificates to operate within that area. This price has to become part of the cost of handling goods to or from that area.

The argument for a limited number of certificates is that with this method fewer motor carriers are allowed into the area and each motor carrier is stronger because of a larger share of the available market. The assumption has been made that strong carriers will provide better service to the shippers and be able to effect cost reductions from economies of scale which will be passed along to the customer. Experience, however, has indicated that such restrictive regulation does not lower rates or improve the service provided to the shippers. There is ample evidence from the analysis of the unregulated transportation of exempt commodities to indicate that in a free market place with numerous smaller companies the shipper has a wide choice of services at normally lower rates, and that the freedom of entry into the market place provides an opportunity for specialized carriers to handle, for example, exclusively small shipments or exclusively truckloads. In

each case, there seem to be enough individuals willing to serve customers with specialized needs. Under the traditional system of regulated common carriage, small shipments in particular are a serious problem and are the subject of a just-concluded ICC study1/ of how to deal with this difficulty. For an excellent study of the effects of entry control on the trucking industry, see the study by James C. Nelson entitled "The Effects of Entry Control on Surface Transport".2/

The 1963 Census of Transportation provides some insight by commodity group into the relative importance of motor carrier transportation as compared with rail and other forms of transportation. The Census of Transportation does not provide any information on the shipment of exempt agricultural products. Exhibit III-15 shows the wide difference between various commodity groups, between various shipper groups, and the use of motor carriers, private trucks, and rail. For example, in the rubber and plastics products shippers' group, 52% of the ton-miles go by common carrier truckers, 6% by private trucks, and 37% by rail, whereas canned, frozen, and other food products are predominantly shipped by rail (with approximately 75% of the ton-miles) with the motor common carriers carrying but 18% of the total ton-miles and private trucks 7%. In summary, when petroleum and coal products are excluded, motor common carriers account for 24.1% of the total ton-miles, private trucks 7.4%, rail 61.9%, and other forms of transportation 6.6%. Petroleum and coal products are excluded because of their very significantly different characteristics of transportation. This product group is shipped primarily by water, (92.9% of the ton-miles), and consequently distorts the comparative statistics of ground transportation modes.

While a comparison of the ton-miles would indicate rail to be of very substantial importance in the national transportation picture, motor carriage should not be underrated as it is the predominant mode of transport for short haul and small shipments. Exhibit III-16 shows that when a comparison is made of the number of shipments moving in various mileage groups, the number of shipments moving by truck predominates in all groups under 200 miles. Exhibit III-17 shows the very important role of the truck in the small shipments group, where trucks predominate for all shipments under 50,000 pounds. On all weights over 50,000 pounds, there is a very definite shift to rail. This sharp

1/ Interstate Commerce Commission, "Small Shipments Problems," March 1968.

2/ Transportation Economics, New York, Columbia University Press, 1965.

Exhibit III-15

Shipper Groups: Ton-Miles Shipped by Mode of Transport

Group	Motor Carrier	Private Truck	Total Truck	Rail	Other
Meat & Dairy Products	36.2%	16.2%	52.4%	46.5%	1.1%
Canned, Frozen and Other Food Products	16.8	6.6	23.4	74.9	1.7
Candy, Beverages and Tobacco Products	27.5	15.6	43.1	53.5	3.4
Textile Mill & Leather Products	58.8	11.5	70.3	25.3	4.4
Apparel & Related Products	62.1	6.7	68.8	10.0	21.2
Paper & Allied Products	20.7	4.6	25.3	70.9	3.8
Chemicals, Plastics, Synthetic Rubber & Fibers	13.8	3.7	17.5	61.8	20.7
Drugs, Paints & Other Chemical Products	24.3	7.3	31.6	61.5	6.9
Petroleum & Coal Products	1.7	1.1	2.8	4.3	92.9
Rubber & Plastics Products	52.4	5.9	58.3	37.0	4.7
Lumber & Wood Products, Except Furniture	6.7	6.9	13.6	83.8	2.6
Furniture & Fixtures	35.9	18.1	54.0	41.4	4.6
Stone, Clay & Glass Products	31.2	14.9	46.1	45.5	8.4
Primary Iron & Steel Products	24.3	2.3	26.6	61.7	11.7
Primary Nonferrous Metal Products	21.0	3.8	24.8	73.2	2.0
Fabricated Metal Products	36.6	17.7	54.3	40.6	5.1
Metal Cans & Products	46.9	7.0	53.9	41.6	4.5
Industrial Machinery Except Electrical	62.2	4.0	66.2	25.4	8.4
Machinery, Except Electrical & Industrial	40.0	4.5	44.5	51.5	4.0
Communication Products & Parts	49.5	3.9	53.4	28.1	18.5
Electrical Products & Supplies	39.5	7.4	46.9	48.4	4.7
Motor Vehicles & Equipment	26.2	2.9	29.1	69.8	1.1
Transportation Equipment Except Motor Vehicles	44.9	16.0	60.0	33.0	7.0
Instruments, Photo Equipment, Watches & Clocks	57.8	3.4	61.2	28.2	10.6
Total All Shipper Groups Except Petroleum and Coal Products	24.1	7.4	31.5	61.9	6.6

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Transportation, 1963

Exhibit III-16

Mode of Transport By Length of Haul

Straight Line Miles	Motor Carrier	Private Truck	Total Truck	Rail	Air	Water	Other
Under 50	32.0%	37.1%	69.1%	16.9%	-	13.1%	0.9%
50-99	34.6	28.7	63.3	21.3	-	15.1	0.3
100-199	33.8	20.5	54.3	33.6	-	11.7	0.4
200-299	32.8	12.9	45.7	39.8	-	13.9	0.6
300-399	29.4	8.4	37.8	44.1	-	17.5	0.6
400-499	28.5	8.1	36.6	55.9	-	6.3	1.2
500-599	27.6	6.0	33.6	57.3	0.1%	8.2	0.8
600-799	20.8	3.9	24.7	50.8	0.1	23.5	0.9
800-999	15.0	2.3	17.3	47.4	0.1	34.2	1.0
1000-1199	5.7	1.1	6.8	21.7	-	70.9	0.6
1200-1499	2.5	0.4	2.9	12.2	-	84.8	0.1
1500-1999	5.9	0.8	6.7	41.8	-	50.6	0.9
2000 or more	7.3	0.7	8.0	69.5	0.3	20.5	1.7
All Distances	25.9	16.2	42.1	32.8	-	24.5	0.6

SOURCE: U.S. Department of Commerce, Bureau of the Census, *Census of Transportation, 1963*

Exhibit III-17

Mode of Transport By Weight of Shipment

Pounds	Motor Carrier	Private Truck	Total Truck	Rail	Air	Water	Other
Under 50	25.5%	16.6%	42.1%	2.0%	2.8%	0.1%	53.0%
50-99	57.6	24.9	82.5	2.6	1.8	0.1	13.0
100-199	65.5	24.1	89.6	3.2	1.1	0.1	6.0
200-499	68.6	24.2	92.8	3.0	0.5	0.1	3.6
500-999	69.1	25.0	94.1	2.5	0.3	0.2	2.9
1,000-1,999	68.9	25.4	94.3	2.6	0.3	0.3	2.5
2,000-2,999	64.6	25.7	90.3	6.9	0.1	0.4	2.3
3,000-4,999	64.2	25.7	89.9	8.3	0.1	0.5	1.2
5,000-9,999	54.1	38.7	92.8	4.9	0.1	0.4	1.8
10,000-19,999	43.8	44.3	88.1	10.5	-	0.5	0.9
20,000-29,999	53.0	28.6	81.6	17.4	-	0.5	0.5
30,000-39,999	56.2	28.0	84.2	14.5	-	0.8	0.5
40,000-49,999	57.5	20.7	78.2	20.0	-	1.6	0.2
50,000-59,999	35.0	18.8	53.8	44.8	-	1.2	0.2
60,000-69,999	8.9	4.1	13.0	84.1	-	2.5	0.4
70,000-79,999	7.7	2.6	10.3	88.3	-	1.1	0.3
80,000-89,999	6.6	2.3	8.9	90.1	-	0.9	0.1
90,000 and over	6.2	4.0	10.2	60.5	-	28.7	0.6

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Transportation, 1963

break in the choice of mode of transportation by the shipper is solely dictated by the cost structure and rate policies of the motor carriers vis-a-vis rail carriers. The typical railroad box car has a capacity of at least 100,000 pounds, and many of the larger box cars in service today can handle up to 180,000 pounds. In contrast, the truckers are limited primarily by Federal and state regulations governing the loaded vehicle weight and the trailer size allowed on state and Federal highways. These limitations confine truck weight to 50,000 pounds and in some states to 40,000 pounds. Because of this disparity in the load-carrying abilities of rail versus truck, rail rate structures are designed to provide incentive to the shippers to load large amounts in rail box cars at greatly reduced rates, thereby preventing the trucker from selling the services of two truck trailers to carry an equivalent amount of weight. The trucker cannot offer the same incentive at the higher weight breaks because his operating costs double when he operates a second vehicle, whereas the railroad incurs little additional cost to handle shipments in the same car in the higher weight groups.

The trucking industry clearly recognizes that it must change the physical characteristics of its equipment in a manner which will allow it to compete more effectively with railroads for shipments in the higher weight categories. This concern of the trucking industry is of importance to New England in the planning of its regional highway system and of the regulation of weight and vehicle size within and between the New England states. Exhibit III-18 illustrates the shift in trailer length in the period from 1948 to 1966. Ten years ago, in 1958, the predominant truck trailer size produced was in the 34 to 36-foot length bracket, whereas by 1966, 73% were in the 38 to 40-foot bracket and significant numbers of trailers were beginning to show in brackets over 40 feet in length. It is also important to note the significant increase in trailers in the size bracket of 26 to 28 feet in length. These are predominantly container-type units designed for multiple-unit operation. The western states have for many years allowed "double bottom" [1]/operation on their highways. With the growing concept of containerization, many trucking companies are buying units in the 26 and 28-foot categories designed so that they may either be joined as one inflexible unit or as a double-bottom unit. The resultant length is a 50-foot vehicle. The trucking industry has been urging upon the states less restrictive

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[1]/"Double bottom" is a trucking industry term referring to the hauling of two truck trailers by one power unit.

EXHIBIT III-18

Change in Length of Truck Trailers Produced Between 1948 and 1966

Length in Feet	(Percent of Total) 1948	1958	1956	1958	1960	1962	1964	1966
Over 42½	-	-	-	-	-	-	0.8	2.3
40-42½	-	-	-	3.0	0.1	3.2	1.1	2.3
38-40	-	-	-	10.0	60.0	81.8	82.4	73.0
36-38	-	2.4	6.7	8.5	6.5	2.4	1.2	1.6
34-36	-	18.9	68.6	64.0	16.6	7.4	3.3	1.8
32-34	16.6	58.7	14.8	5.5	2.8	0.9	0.7	0.4
30-32	23.9	10.4	2.0	3.0	2.0	0.6	1.2	0.8
28-30	27.5	3.2	0.9	2.0	2.5	0.6	1.7	0.5
26-28	18.8	1.1	0.6	1.0	6.4	1.3	4.4	15.4
24-26	6.5	1.8	1.0	0.5	1.0	0.9	2.9	1.3
22-24	5.3	1.6	1.6	2.5	0.5	0.2	0.2	0.6
Under 22	1.4	1.9	3.8	-	1.6	0.7	0.1	-

Source: Truck Trailer Manufacturers Association.

requirements on vehicle length which would enable them to fully utilize such containers. At the present time in New England only the Massachusetts Turnpike allows double bottom operation and is planning to permit, on a trial basis, triple bottom operation.

b. Truck Vehicles in New England

Up to this point the discussion has been concerned primarily with trucks as they relate to the transportation of manufactured products by regulated carriers. When the total population of trucks in New England is considered, truck transportation is described in entirely different terms. Exhibit III-19 shows the truck registrations by New England states for the years 1962, 1964 and 1966. Comparing the percentage change between 1962 and 1966 of total registrations in New England with that of the total United States, the exhibit shows that New England has grown at a slower rate than the total United States. The same exhibit shows the sharp difference in the growth of truck registrations between the six New England states. Massachusetts has the slowest growth in truck registrations (8.1%) as compared with the national average of 21.1%, while Vermont is the only New England state to have a growth rate (28.0%) greater than the national. In sharp contrast to the percentage comparison in total truck registrations is that of new trucks in each of the New England states. The three northern New England states show the greatest increases in new truck registrations and, with the exception of New Hampshire, are very close to the national average. The three southern New England states have a substantially lower percentage change in new truck registrations as compared with the rest of the United States, and New England as a whole is also substantially below the same comparative growth. A possible conclusion that can be drawn from these statistics is that the New England truck fleet is becoming older than that of the rest of the United States; and especially in the case of southern New England, if its truck fleet is to keep pace with the age of fleet in the rest of the United States, truck sales must surge forward to fill the gap.

It is possible to hypothesize from this that at some future date New England truckers will have substantial fleet renewals. If this is so, there could be a sudden surge in the purchase of vehicles of much higher load and length characteristics than is now in the equipment mix of New England; if this is true, then New England highways

Exhibit III-19

Growth in New Truck and Total Truck Registrations in New England

	New Truck Registrations			Total Motor Truck Registrations			% Change 1962-1966	
	1962	1964	1966	1962	1964	1966	New Trucks	Total Reg.
Maine	5,725	7,467	8,680	76,349	76,884	82,620	51.6%	8.2%
New Hampshire	4,915	5,638	6,616	49,553	52,971	53,598	34.6	8.2
Vermont	2,903	3,920	4,442	31,316	32,404	40,100	53.0	28.0
Massachusetts	16,483	20,849	20,365	201,809	204,895	218,213	23.6	8.1
Rhode Island	3,355	3,632	3,912	39,053	41,678	46,067	16.6	18.0
Connecticut	10,890	13,624	13,391	132,683	149,302	160,579	23.0	21.0
Total New England	44,271	55,130	57,406	530,758	558,114	601,177	29.7%	13.3%
Total U.S.	1,068,725	1,361,772	1,610,450	12,809,150	14,013,112	15,522,114	50.7%	21.2%

SOURCE: Automobile Manufacturers Association, Motor Truck Facts, Detroit, Michigan, 1967 Edition.

must be geared to the higher design standards which the trucking industry is seeking. All of the New England states, possibly collectively through the New England Regional Commission, should prepare themselves now to make decisions about weight and size limitations on truck vehicles so that both the trucking companies of New England and New England shippers may benefit from standardization and from realistic and economic size and weight regulations.

A comparison of distribution of truck size in New England as compared with other United States areas (Exhibit III-20) reveals that New England highways must bear a burden of heavier trucks than those of other regions of the United States or the United States as a whole. The burden of heavier trucks falls quite heavily on each of the New England states, but especially on Massachusetts, a substantial percentage of whose vehicles is in the heavier weight classes. Similarly, Vermont also has a heavy burden, but Connecticut, in complete contrast to the other five New England states, bears a substantially less burden on its highways (see Exhibit III-21).

The total effect of the analysis of forthcoming greater length and weight requirements on New England highways, coupled with the already existing frequent use of New England highways by heavy vehicles indicates that New England highway design must be geared to high truck standards. Such high standards, however, must be put in the perspective of the cost that they add to highway construction and maintenance. Clearly, highway financing and tax policies should be geared so that the incremental highway costs associated with the changes in dimension and weight limits are assessed to the vehicles gaining the benefits. In addition to direct financial effects, consideration should be given to safety and efficiency of traffic flow. If the effect upon other vehicles includes such things as increased traffic stream congestion because of longer vehicle length and greater spacing required because of greater vehicle weights, constant speed of the traffic flow becomes another consideration. As higher gross weights are allowed, consideration must be given to requiring minimum horsepower-to-weight ratios for larger vehicles to assure sufficient power to move the vehicles at established minimum speeds and to effectuate such minimum speeds on grades. Additional research is necessary to produce facts on which to base these decisions, and it is recommended that the Commission arrange to have such research done.

Exhibit III-20

PERCENTAGE DISTRIBUTION OF TRUCK SIZE IN NEW ENGLAND AS COMPARED WITH OTHER U.S. AREAS - 1963

Truck Size Class	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific	U.S.
Light	64.6	65.1	68.8	68.4	73.3	74.1	79.5	78.8	82.2	73.3
Medium	12.0	11.0	12.1	11.2	9.6	9.3	6.3	6.8	6.9	9.4
Light-Heavy	16.6	14.7	11.1	15.5	9.9	9.6	8.2	9.8	6.8	10.9
Heavy-Heavy	6.8	9.2	8.0	4.9	7.2	7.0	6.0	4.6	4.1	6.4
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Definitions: Approximate definitions of Truck Size Class are listed below. See Census of Transportation, Truck Inventory and Use Survey, for more precise definitions.

	Gross Vehicle Weight
Light	10,000 lbs. or less
Medium	10,001 to 19,500 lbs.
Light-Heavy	19,501 to 26,000 lbs.
Heavy-Heavy	26,000 lbs. or more

SOURCE: Census of Transportation, Truck Inventory and Use Survey

Exhibit III-21

Distribution of Truck Size in New England
By State
1963
(Percent)

Truck Size Class	Me.	N.H.	Vt.	Mass.	R.I.	Conn.	N.E.
Light	67.6	67.0	60.0	59.8	64.6	68.6	64.6
Medium	8.0	13.2	17.8	13.0	13.7	11.8	12.0
Light-Heavy	19.2	13.0	16.5	17.0	14.0	16.6	16.6
Heavy-Heavy	5.2	6.8	5.7	10.2	7.7	3.0	6.8
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Definitions: See Exhibit III-20

SOURCE: U. S. Department of Commerce, Bureau of the Census, Census of Transportation: Truck Inventory and Use Survey.

c. Common Carrier Truck Service Provided to the New England Shipper

For the majority of New England shippers there is a wide choice of trucking companies, each competing for the business of New England shippers. There is, however, a clearly different competitive situation existing in the three northern New England states as compared with the three southern New England states. Exhibit III-22 shows the number of trucking companies providing service between each of the New England states and all other states. For the southern New England shipper there is always some carrier available who provides direct service to any other state, along with a high density of carriers providing intra-state service. In Massachusetts alone there are 148 firms competing for Massachusetts intra-state business. In Rhode Island there are 75 carriers and in Connecticut, 54. In comparison, Maine has 27 intra-state carriers, New Hampshire, 41 and Vermont only 13. Maine, New Hampshire and Vermont have direct service only to the Middle Atlantic and southern states; they have no direct carrier service to any state north of the Ohio and west of the Mississippi Rivers, except for Missouri; all such service must be provided via connecting carriers.

d. Cost Analysis of New England Motor Common Carriers of General Commodities

There are 88 motor carriers of general commodities whose operations are principally within the six New England states. Numerous other trucking companies also provide service between New England and other regions of the United States. A comparison of the financial results of the New England trucking companies with those of other eastern regions in the United States indicates that the New England trucker is not without problems. Exhibit III-23 shows a comparison of the net operating revenue and various expense categories of New England-domiciled trucking companies with those of other regions, expressed as a percent of total operating revenue. The net operating revenue of New England carriers is 2.3% of the total operating revenue (1966). For all carriers in the United States, the net operating revenue is 5.1% of total operating revenue. Only the motor carriers which have operating rights throughout the whole eastern United States have a lower net operating revenue percentage than the New England carriers. An analysis of why the New England carriers are not closer to the national average in net operating revenues or net income after taxes reveals that their total labor costs as a percentage of total operating revenue is substantially higher than that for all other similar carriers. The reason that the New

Exhibit III-22

Number of Common Carrier Trucking Companies
Providing Interstate Service from Each New England State
and Providing Intrastate Service Within Those States

Interstate Service from Points in the N.E. States to Other States	Me.	N.H.	Vt.	Mass.	R.I.	Conn.
Alabama	-	-	-	4	5	4
Alaska	-	-	-	1	1	1
Arizona	-	-	-	6	6	4
Arkansas	-	-	-	4	4	4
California	-	-	-	6	6	4
Colorado	-	-	-	7	7	5
Connecticut	8	14	7	70	57	53
Delaware	4	5	3	16	14	13
Dist. of Col.	3	4	2	13	12	16
Florida	-	-	-	4	3	13
Georgia	1	1	1	13	12	10
Hawaii	-	-	-	-	-	-
Idaho	-	-	-	2	2	2
Illinois	-	1	-	22	18	18
Indiana	-	1	-	22	19	19
Iowa	-	1	-	12	12	8
Kansas	-	-	-	13	12	11
Kentucky	-	-	-	15	15	14
Louisiana	-	-	-	3	3	3
Maine	18	19	5	27	22	6
Maryland	3	5	2	18	17	18
Massachusetts	27	41	13	148	75	54
Michigan	-	1	-	13	13	10
Minnesota	-	-	-	6	6	6
Mississippi	-	-	-	3	3	3
Missouri	-	1	-	17	16	14
Montana	-	-	-	3	3	3
Nebraska	-	-	-	6	6	5
Nevada	-	-	-	4	5	4
New Hampshire	22	20	12	46	23	13
New Jersey	6	10	6	67	47	67
New Mexico	-	-	-	4	4	3
New York	6	15	8	78	57	72
North Carolina	2	3	1	14	13	11
North Dakota	-	-	-	3	3	3
Ohio	-	1	-	20	18	18
Oklahoma	-	-	-	7	8	5
Oregon	-	-	-	4	5	3

Exhibit III-22 (cont'd)

	Me.	N.H.	Vt.	Mass.	R.I.	Conn.
Pennsylvania	4	7	5	48	38	38
Rhode Island	13	16	6	86	44	38
South Carolina	1	1	1	12	11	10
South Dakota	-	-	-	2	2	2
Tennessee	-	1	-	8	8	6
Texas	-	-	-	8	8	6
Utah	-	-	-	4	4	3
Vermont	5	12	7	17	8	7
Virginia	3	4	2	18	19	16
Washington	-	-	-	5	5	3
W. Virginia	1	1	1	12	12	16
Wisconsin	-	-	-	9	9	9
Wyoming	-	-	-	3	3	3
Canada						
Alberta	-	-	-	1	1	1
British Col.	-	-	-	1	1	1
Manitoba	-	-	-	1	1	1
New Brunswick	4	2	1	2	2	-
Newfoundland	2	1	1	1	1	-
Nova Scotia	3	2	1	2	2	-
Ontario	-	-	-	2	2	-
Prince Edw. Is.	3	2	1	2	2	-
Quebec	4	2	2	3	3	1
Saskatchewan	-	-	-	-	-	-
Yukon Terr.	-	-	-	1	1	1
Mexico	-	-	-	-	-	-

SOURCE: Guide Services, Inc., American Motor Carrier Directory, National Edition, Atlanta, Ga., Fall 1966

Exhibit III-23

NET OPERATING REVENUE AND EXPENSES AS A PERCENT OF TOTAL OPERATING REVENUE
OF NEW ENGLAND TRUCKING COMPANIES AS COMPARED WITH THOSE SERVING OTHER AREAS
(GENERAL FREIGHT CARRIERS)
1966

	New England	North Middle Atlantic	Middle Atlantic	Central States-East	Central States-West	Central States	Eastern	Eastern Central	Trans-Continental	Total U.S.
No. of Carriers	88	144	120	100	88	90	65	38	18	1,217
Net Operating Revenue	2.3	3.9	3.4	5.7	3.3	4.1	1.8	5.0	7.5	5.1
Net Income After Taxes	1.3	2.4	1.8	3.2	1.9	2.4	0.2	3.0	4.2	2.8
Equipment Maintenance	9.0	8.6	8.8	8.0	8.5	8.9	7.8	7.9	10.5	8.9
Transportation	46.7	46.8	49.7	50.1	46.6	46.7	50.8	49.7	39.3	44.7
Terminal	14.1	15.3	13.9	12.7	18.2	18.6	15.6	16.6	19.6	18.3
Traffic	3.2	3.4	3.4	2.9	2.9	3.1	3.4	3.1	3.4	3.2
Insurance & Safety	4.4	4.4	4.1	3.4	3.9	3.6	4.7	3.9	3.6	3.9
General & Administrative	9.2	7.6	7.2	7.2	7.0	5.1	6.9	4.5	4.3	5.5
Depreciation & Amortization	4.3	3.6	3.6	3.6	3.8	3.8	3.2	3.3	4.0	3.8
Taxes & Licenses	6.8	6.2	5.9	6.4	5.8	6.1	5.8	6.0	7.8	6.6
Total Labor	55.3	48.3	48.6	47.0	51.9	52.1	52.1	46.1	51.3	50.4

SOURCE: Trinc's Blue Book of the Trucking Industry, 1967 Edition, Trinc Associates, Washington, D.C.

England truckers have such high labor costs is apparent from a comparison of the average load and the average length of haul of these carriers with those in other sections of the United States. Despite the conclusions of the analysis of previous sections that New England highways carry a larger proportion of heavy trucks than do those in other regions of the United States, the average load in these same vehicles is substantially less than that of the other regions. For the New England carriers the average load is 5.4 tons per vehicle, whereas the national average is 12.1 tons per vehicle. The discrepancy between these figures and those in Exhibits III-20 and III-21 can be partially explained by the fact that the carriers categorized under New England are only those providing service primarily within New England and do not include those providing service between New England and states outside the region. Exhibit III-24 shows that the loads carried by interregional carriers were about double the loads carried by the New England truckers.

Exhibit III-24 also illustrates the short-haul characteristic of New England traffic. The average length of haul for the New England carriers is 96 miles, whereas the national average haul is 322 miles. The only other United States region close to New England in average length of haul is the Central States East region with 109 miles average haul.

The high-cost characteristics of the New England trucking companies definitely reflect in their revenue as compared with that of the carriers in other regions. This is measured in Exhibit III-25, which shows the freight revenue per ton-mile for each of the regions. The freight revenue per ton-mile earned by New England carriers is more than double the national average and is about one third higher than that received by trucking companies in other eastern regions. This does not reflect the rates paid by New England shippers to get their products to the rest of the country, since the carriers in the New England group are primarily intraregional carriers. The comparison of interregional rates outlined in Appendix D indicates that New England shippers pay rates not out of line with those of other regions.

2. <u>The Bus Industry</u>

As indicated in Chapter II, with the appearance of the interstate highway system and the demise of rail passenger service, the bus has become the generally available mode of public conveyance. Furthermore, in two respects at least, it fits this role admirably. First, it is relatively small, without complicating labor-imposed work rules, and thus can economically provide reasonable frequency for the small percent of travellers who will not or cannot travel by auto. Second, it needs no right-of-way especially built for it, but generally uses as a pure by-product the highway

Exhibit III-24

Comparison of Average Load and Average Length of Haul of New England Trucking Companies With Those of Trucking Companies in Other Regions in 1966 (General Freight Carriers)

	New England	No. Middle Atlantic	Middle Atlantic	Central States East	Central States West
Average Load (Tons)	5.4	9.6	9.8	10.3	10.4
Average Haul (Miles)	96	160	168	109	133

	Central States	Eastern	Eastern Central	Trans-continental	Total U.S.
Average Load (Tons)	11.4	10.0	13.9	14.4	12.1
Average Haul (Miles)	202	212	450	681	322

SOURCE: Trinc Associates, Trinc's Blue Book of the Trucking Industry, 1967 Edition, Washington, D. C.

Exhibit III-25

Comparison of New England Trucking Companies
with Those of Other Regions
in Terms of Average Freight Revenue Per Ton-Mile

(General Freight Carriers)
1966

Region	Average Freight Revenue Per Ton-Mile (¢)
New England	17.8
North Middle Atlantic	12.8
Middle Atlantic	11.2
Central States East	11.1
Central States West	11.0
Central States	9.2
Eastern	10.4
Eastern Central	6.2
Transcontinental	5.6
United States	7.4

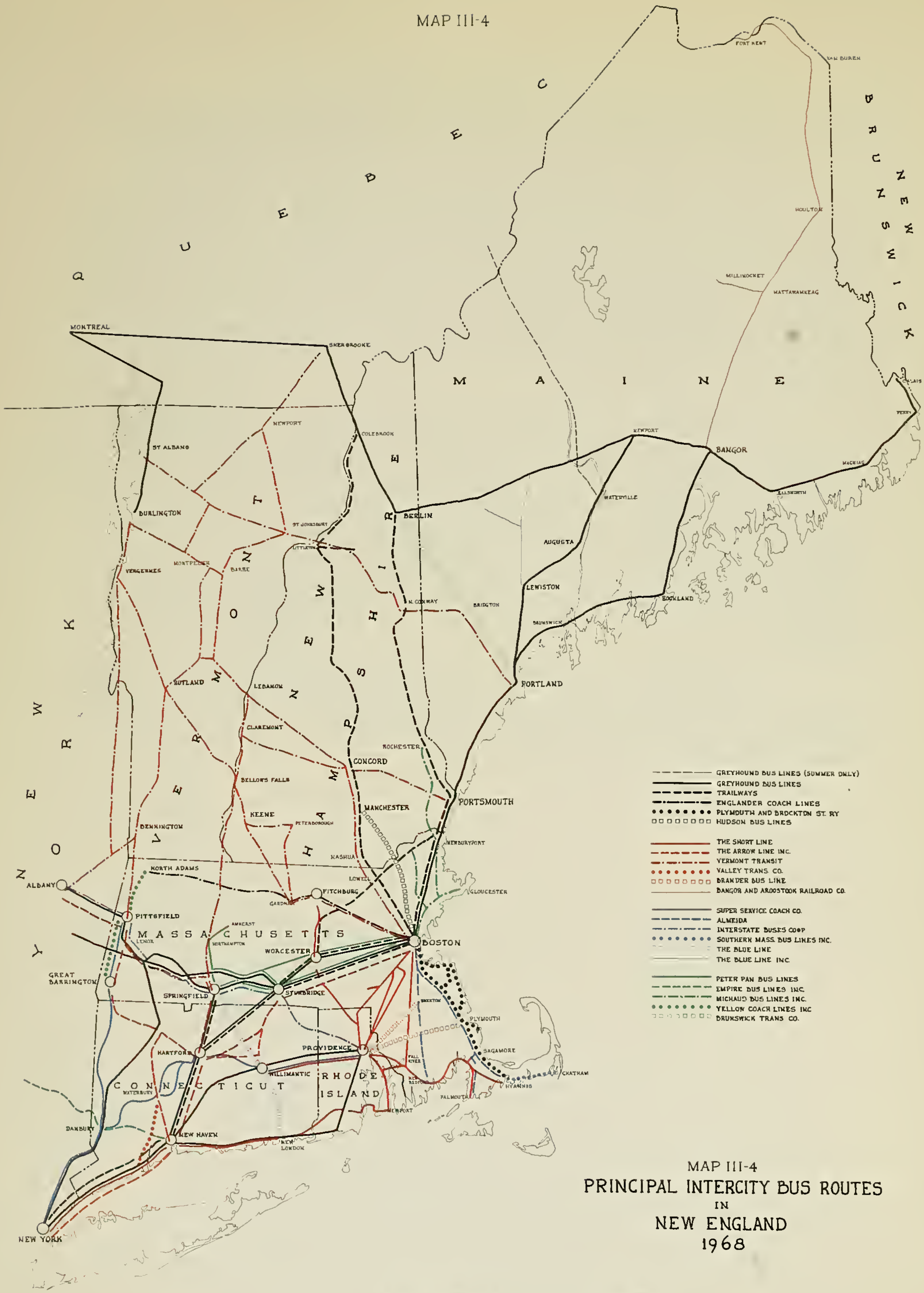
SOURCE: Trinc Associates, op. cit.

built for automobiles. Its major terminals are traditionally modest, and its way stations virtually non-existent.

As a result, bus service has become ubiquitous, as Map III-4 shows. In northern New England it is the only means of public transport except the airplane. Even in much more densely populated southern New England, its use is widespread, although in this area its limited capacity tends to become more of a handicap than an advantage. In Boston and New York commuting service, as well as Boston-New York intercity service, a higher capacity mode is required, but not elsewhere in the region.

Regulation of buses is similar to that of trucks, described above, requiring similar certificates. Common carriers are the familiar regularly scheduled bus lines. Contract carriers include such operations as school buses and charters. Many companies offer both types of service, and it is a maxim of the industry that many an operator of scheduled service is saved from bankruptcy by his charter business. Private carriage in the passenger field is, of course, provided by the automobile, the overwhelming preference of 90% to 95% of travellers by all modes in New England.

Regularly scheduled bus companies now offer a small package service generally throughout the region which makes a real contribution to the solution of the small-shipment problem, earlier discussed.



MAP III-4
PRINCIPAL INTERCITY BUS ROUTES
IN
NEW ENGLAND
1968

SOURCE: RUSSELL'S OFFICIAL NATIONAL MOTOR COACH GUIDE, MAY 1968

E. URBAN-SUBURBAN CIRCULATION

1. Urban Circulation Congestion

The efficient movement of people and goods within and through New England's urban places was a serious problem long before the development and widespread use of the automobile. In recent years, the construction of high capacity urban freeways began to provide better service to and from the central cities. Early studies[1/] of freeway users have shown that up to 50% of motorists will choose freeways over other alternate routes even though both time and distance penalties result. It is most difficult to explain why motorists will endure time, distance and cost penalties by choosing a freeway route over an alternate non-freeway route or another mode except by a strong determination to "keep moving". While these facilities have helped improve urban mobility particularly for longer trips, several points are becoming increasingly evident:

1. The congestion which develops on portions of the freeway system will encourage the use of alternate routes and alternate modes where available.

2. At both ends of the freeway, the arterial street system must be used to complete the trip. Since the freeway itself substantially redirects traffic patterns, new and difficult pressures are often exerted on the arterial street system.

3. As an aid to internal circulation within the urban area, the freeway offers little help. This is due to the spatial requirements of both the interchanges and the freeways themselves.

4. The basic freeway system now partially built and partially on the drawing boards will undoubtedly form the freeway system for many years in the future. The opportunity to make large-scale additions to this network within the established portions of the region's urban areas will be minimum.

5. Boston excluded, the New England cities are

1/ D. L. Trueblood, Effect of Travel Time and Distance on Freeway Usage, National Academy of Sciences, Highway Research Board, Bulletin 61.

of a size and population density which will not encourage the use of existing rail rapid transit technology.

6. Since change in transportation technology is evolutionary in nature, the development of completely new urban transportation modes is years away.

While this appears to portray a bleak future, there is an approach to the urban circulation dilemma which offers promise of appreciable improvement in the quality and capacity of traffic flow. In short, the approach consists of a carefully planned and professionally organized program to increase the operational efficiency and capacity of the existing arterial street systems. The opportunities which such an effort offers are discussed in some detail in the following paragraphs.

2. Urban Circulation Improvement

Some ten years ago, Ellis Armstrong, then Commissioner of the Bureau of Public Roads, in response to a question about the future of highway design had this concept to offer: "The 99 million vehicles of 1970 will be operating on a highway network essentially of the same _extent_ as we now have -- some 3.4 million miles of roads and streets..... The crying need which we hope to accomplish to fairly extensive measure by 1970 is not _more_ miles, but better ones....." Unfortunately, while this prophecy has proved accurate in relation to rural inter-city travel, the region has not seen comparable improvement in the quality of travel within the cities.

The basic street networks in New England cities were conceived, built and developed before the advent of the auto. Typically they exhibit the following characteristics which together place large restraints on urban circulation:

1. The networks are discontinuous to a significant degree.

2. The networks have much adverse geometry.

3. The rights-of-way are narrow and often vary in width along a given street.

4. Abutting land use is intense in nature.

5. The principal arterial streets are often ill defined from legislative and functional viewpoints.

All of these constraints manifest themselves in a degree of congestion and accident frequency which needs little description here.

While the problems of improving the quality and capacity of flow on urban arterials are more difficult to solve in the typical New England urban area, far less effort has been expended in this approach than in other regions of the country. The traffic engineering profession, while still in its infancy (the City of Cincinnati hired the first full-time traffic engineer in 1930), has much to offer in the application of design and operational techniques to the solutions of traffic problems. Even though New England has some 290 urban areas, 87 having populations of over 25,000 (see Exhibit III-26), only a handful have professionally educated and trained traffic engineers in full-time staff positions. Portland is the only city in the three northern New England states which has a city traffic engineer. In Massachusetts, only four of the twenty urban areas with populations over 50,000 have staff traffic engineers.

New England has an incalculable investment in city streets and highways. Outside of tourism, agriculture, and those industries relying on proximity to natural resources, most of the economic development of the region has taken place in and around the urban areas; and the recipe for healthy development in future years has good access and improved circulation as important ingredients. The inter-modal movements between airports, rail centers, truck terminals, and port facilities depend largely on the use of urban arterials. In short, the urban arterial street involves every conceivable element of the day-to-day travel spectrum. This system of streets and highways in New England's urban and suburban areas is now operating at a fraction of its potential efficiency, and this is a direct result of almost total operational neglect that has paralleled the preoccupation with construction of <u>new</u> facilities on <u>new</u> rights-of-way.

A program aimed at correcting this neglect would necessarily have a very large cost-effectiveness ratio, due to the relatively small costs involved and the heavy concentration of travel on the facilities. The specific kinds of improvements needed range over the following activities:

EXHIBIT III-26

Size of Urban Places in New England
1960

Area	Number of Urban Places	Population Range Under 5,000	5,000-10,000	10,000-25,000	25,000-50,000	Over 50,000
Connecticut	61	20	8	9	14	10
Maine	50	25	12	10	2	1
Massachusetts	119	31	14	26	28	20
New Hampshire	24	9	5	6	3	1
Rhode Island	18	4	2	5	3	4
Vermont	18	6	9	2	1	-
New England	290	95	50	58	51	36

Source: U.S. Department of Commerce, Bureau of the Census, 1960 Census of Population.

1) Channelization and signalization of intersections

2) Addition of lanes to intersection approaches

3) Application of the more versatile and responsive traffic signal equipment

4) Application of one-way street systems

5) Control of curb parking

6) Selective widening to eliminate physical bottlenecks

7) Elimination of pedestrian and vehicle conflicts

8) Grade separations at intersections of major arterials

9) Control of access

10) Application of guide and regulatory signing and pavement markings

11) Street lighting

12) Pavement reconstruction

Most of the activities listed can be accomplished within the prevailing rights-of-way and basically represent modified or selected applications of techniques used to achieve the efficiency of flow attained in the more expensive and modern freeway systems. The U. S. Department of Transportation has piloted a similar program in the last year called TOPICS (Traffic Operations Program to Increase Capacity and Safety), but as yet has not supplied the program with separate or additional funds. An action program for New England should go beyond TOPICS by adding the provision for the replacement, in off-street lots, of curb parking eliminated to increase capacity and safety. The effect of the additions will be substantially greater than appears on the surface. For example, elimination of parking on a city street which has two lanes for moving traffic can increase capacity by more than 100%. This is due to the interference of parking movements with flow on the existing two traffic lanes in addition to the two lanes of space occupied by the parked vehicles. The early development of New England's street system has resulted in extensive commercial and residential use of abutting properties, and elimination of the

existing curb parking without replacement can in many instances impose intolerable hardships. In recognition of this situation any arterial improvement program should provide for replacement curb parking in "vest pocket" parking lots. To be effective, these lots must have access from the arterial streets, be relatively small in size, (i.e., 10-35 spaces), judiciously located block by block, and strategically placed with reference to the major traffic generators. With the exception of forest highways, forest development roads and trails, and rest areas on rural Federal Aid highways, the application of Federal funds for road and street construction has not included parking facilities.

The pressing need for assistance in relieving urban-suburban circulation pressures extends throughout New England, and promotion of such an improvement program could be effectively initiated by the New England Regional Commission. The amount of engineering, planning and design effort would be relatively large in proportion to the total program cost, and the mechanics of the program would necessarily vary depending upon the availability of talent at the local level and the size of the area. The larger central cities (50,000) should be encouraged to establish traffic engineering capability on a staff basis, and the program could be executed directly. For the smaller communities unable to justify this procedure, the engineering inputs could be supplied by the regional planning agency or by the state highway department. The current fiscal problems of the cities and towns in the region and the history of operational neglect suggest that the Federal portion of program costs in this area should be substantially more than the current 50%, if effective action is to become a reality. The consultant suggests that the Commission invite a small group of public officials, active in the field to serve in an advisory capacity during formulation of the program. This committee, with membership from the state highway departments' traffic and planning unit, city traffic engineering departments and regional planning agencies could provide the commission with the expertise necessary to guide the following program steps:

a) Quantitative definition of urban circulation needs in the region

b) Design of a continuing improvement program

c) Definition of administrative procedures for program execution

d) Progress evaluation

F. ADDITIONAL RURAL HIGHWAY DEVELOPMENT

1. Introduction

The construction of the Federal Interstate Highway System has satisfied the primary system needs in rural areas to a substantial degree. Improvements and construction of rural secondary roads and the connecting roads to expressway interchanges has lagged during the period of Federal interstate expressway construction.

2. Rural Highway Needs of the Region

Statistics are available which, in a general way, point to some of the region's highway deficiencies. Exhibit III-7 (p.95) indicates that in the New England Region 10% more of the rural roads are under 20 feet in width than in the nation as a whole. In Maine and Rhode Island the percentage is nearly twice the national average. Exhibit III-4 (p. 91) indicates that New England ranks next to the lowest in the ratio of surfaced streets and highways to population while Exhibit III-8 (p. 98) indicates that New England has the lowest percent of surfaced mileage on the Federal aid systems. It appears from these statistics that New England is suffering from a highway quality deficiency relative to the rest of the nation, especially in its secondary systems.

One specific manner of highway development which offers potential for expanding economic growth in the less developed parts of the region is the construction of lateral feeder roads off the interstate expressways.

Construction of feeder roads off the expressways should also be considered in the comprehensive planning of educational, medical, and cultural facilities to increase their availability.

3. Development of Controls Near Interchanges

Route 128 in Massachusetts serves as an example of expressway and interchange congestion problems created by rapid economic growth and the motorist's desire to sacrifice time and distance to keep moving.

While this is only one highway adjacent to, and influenced by, a single metropolitan area, it nevertheless represents a condition and a chain of circumstances which are being repeated to some degree around nearly every metropolitan area. Due to the rapidity with which events and changes occurred in this instance, it offers an

excellent view into the future for the prediction of, and the preparation for, similar problems in areas experiencing similar, but perhaps slower or later growth.

Originally heralded by its critics as the "road to nowhere," the phenomenal economic development which followed the Route 128 construction was so intense as to render large portions of it obsolete less than 10 years after its construction, thereby requiring total reconstruction of some 4-lane sections to 8-lanes. These are already carrying capacity volumes. Unfortunately, the reconstruction of Route 128 was unable to completely provide for the economic growth that it helped to develop.

The first and most intense economic growth quite naturally developed near the highway and generally fronted on the connecting roads near the interchanges. It is here that the current congestion problem can be found and experience acquired for application throughout the region. While the expressway and the interchanges were constructed to high standards, little attention was given to many of the connecting roads beyond the immediate vicinity of the interchanges. The result today is that some connecting roads cannot accommodate the traffic that their locations have generated, while the proximity of the abutting developments has made their necessary improvement exceedingly difficult.

It is recommended the Commission consider sponsoring a program which would:

1. Inventory and evaluate the roads both interconnected with and crossing the expressway system.

2. Establish criteria for feeder road traffic capacity and the effect on capacity of zoning, unlimited and limited access to feeder roads, and the distance from expressway ramps to feeder road access ways.

3. Recommend the desirability and feasibility of establishing feeder road standards within certain distances of expressway connections.

4. Recommend the necessity for funds to improve feeder road capacities or acquiring rights-of-way to eliminate future congestion.

It is estimated the program would require a budget

of approximately $50,000 to furnish definitive recommendations on a regional basis.

G. POTENTIAL ADDITIONS TO THE EXPRESSWAY SYSTEM

1. Introduction

Certain additions to the planned interstate and expressway system have been suggested by various public and private agencies in the region to meet both local and regional needs. This report has not attempted a complete inventory of these proposals but has examined certain suggested additions to the system because of their magnitude or potential significance.

2. North-South Highway

Interstate Route 95 has established a North-South expressway linking the major coastal urban population centers and interstate Route 91, 75 miles to the West, has served a similar function along the Connecticut River Valley.

The urban centers approximately midway between these systems (i.e., Norwich, Worcester, Fitchburg and South Central New Hampshire) have no comparable North-South expressway system.

The Connecticut Turnpike construction to Danielson and the planned construction to the Massachusetts State Line has established the Southern portion of an expressway system to the Worcester area. Massachusetts has the connection from the Connecticut State Line to Worcester in the preliminary engineering and planning stages.

The connection linking Worcester to the Fitchburg-Leominister area was studied by the Massachusetts Turnpike Authority as a toll expressway. The result of the study indicated the Worcester-Fitchburg link was not self-supporting as a toll road facility. The Massachusetts Department of Public Works subsequently included the project in the Federal Aid Primary Systems Program. The estimated cost of the Worcester-Fitchburg link is $90,000,000.

The connections from the Fitchburg area to Nashua and Keene are in the preliminary planning stages. The estimated cost of road construction from Fitchburg to Keene and Nashua is $170,000,000.

No action by the Commission is recommended at this time since the portions of this proposed North-South expressway from Norwich, Connecticut to South Central New

Hampshire not included in a projected construction program are under study by the Massachusetts and New Hampshire Highway Departments.

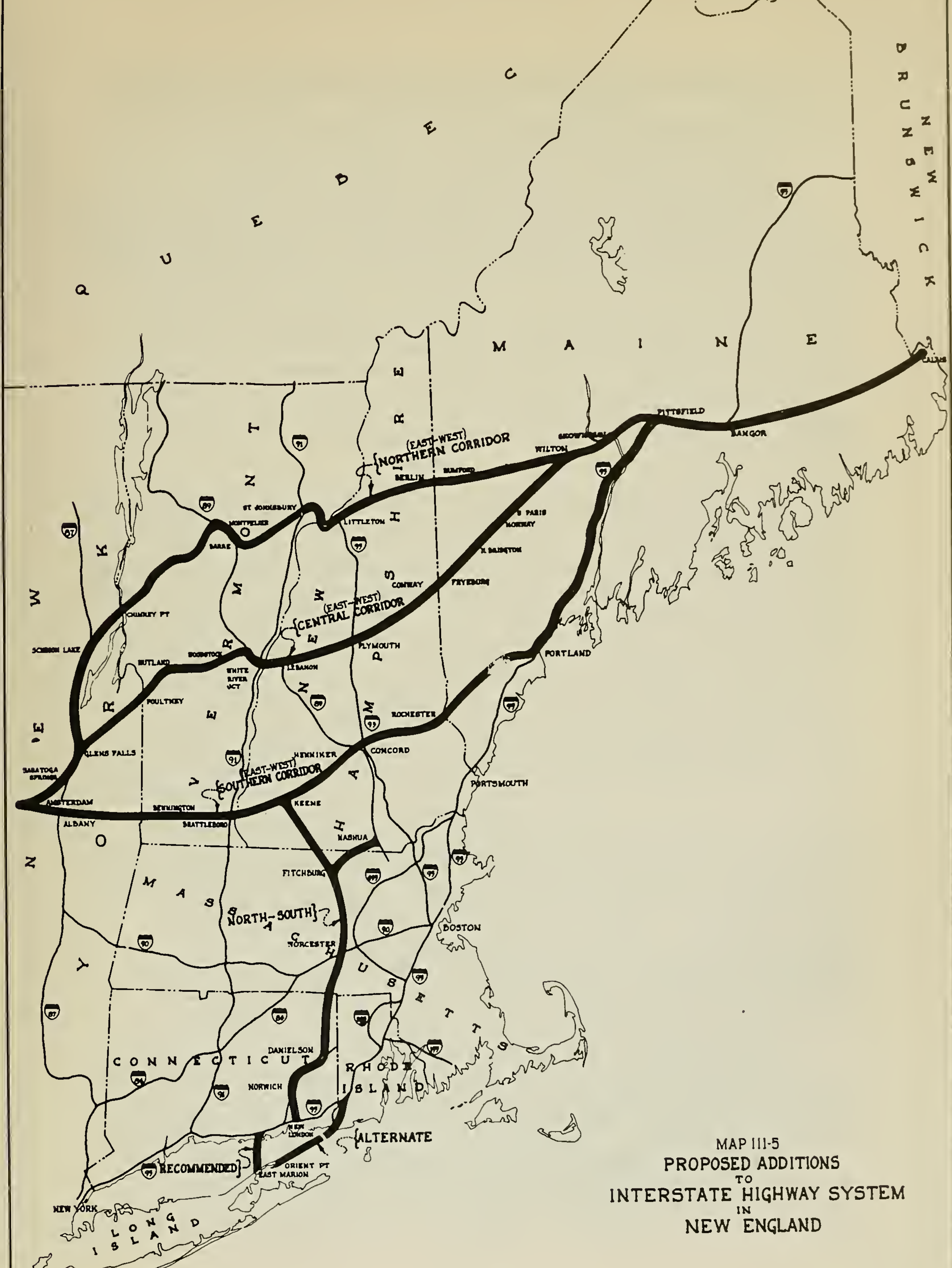
3. The East-West Highway

While there has been a considerable amount of discussion of an East-West highway through northern New England in recent months, original proposals for such a facility date back at least twenty years. The increased attention to the proposal in the most recent past is undoubtedly related to the progress made in the Interstate System which directly serves most of the other regional corridors. The existing system of intra-regional highways (see Map III-5) is basically North-South oriented with a pronounced radial pattern focusing on the larger urban areas of Boston, Providence and Hartford. The North-South orientation is particularly strong in the three northern states and follows early development patterns which depended heavily upon access by water. As the development proceeded up and down the seacoast and inland along the river valleys, the basic population pattern was determined by the two interrelated factors of transportation access and topography. In later periods the configuration of both highway and railroad networks in Maine, New Hampshire and Vermont was heavily influenced by the existing development pattern and the mountainous terrain which discourages East-West movement. Those East-West highway facilities which have been built in northern New England have been expensive to construct and maintain and generally reflect the difficult topography in circuitous routing and adverse geometric characteristics.

The advent of the Interstate System with its resulting travel time advantages has served to emphasize the difficulties of East-West highway travel across the three northern states. Speaking strictly in terms of the general configuration of the regional network, the absence of a high-quality route linking Maine, New Hampshire and Vermont with New York is an obvious gap. The need for such a highway in terms of traffic demand, general economic development, and recreation travel demand is not as clear. Furthermore, the effect of the investment in the road on other highway and non-highway programs is an important consideration. An extensive analysis of these questions is well beyond the scope of this study. However, a basic study was made aimed at the following goals:

1. Definition and description of the alternative

MAP III-5



MAP III-5
PROPOSED ADDITIONS
TO
INTERSTATE HIGHWAY SYSTEM
IN
NEW ENGLAND

corridors in which the facility might be built.

2. An approximation of the cost of the facility.

3. An outline for a detailed study program.

In attempting to define the possible corridors through which an East-West facility might pass, the consultant has considered existing proposals, traffic volumes on existing routes and topography. It should be emphasized that the goal has been to identify general corridors worthy of study rather than pinpoint specific locations. Furthermore, the corridors do not include additional spurs or long connecting links which may be desirable as part of an overall freeway network for the northern half of the region. The analysis has shown that there are three distinct corridors which should be considered in any further study program.

The first and northernmost corridor for the East-West highway would proceed northeast from Amsterdam to join I-87 in the vicinity of Saratoga Springs. From there it would follow Schroon Lake, N. Y. and then cross Lake Champlain in the vicinity of the existing toll bridge at Chimney Point. It would then proceed northwest to Montpelier and from there it would generally parallel existing Route 2 through Barre and then north to St. Johnsbury and Interstate 91. From St. Johnsbury, the proposed alignment of Interstate 93 could be followed across the Connecticut River into New Hampshire as far as Littleton. From Littleton, the corridor would utilize a new right-of-way East through Whitefield and then to Gorham, New Hampshire just North of the major part of White Mountains National Forest. In this location the route would generally parallel existing Route 2. From Berlin, New Hampshire, the corridor would continue easterly into Maine, still following Route 2 through the Rumford/Mexico urban area to Farmington and Skowhegan, and finally tying into Interstate 95 in Pittsfield, Maine. Interstate 95 would be utilized from Pittsfield to Bangor, and the last link from Bangor to Calais would be a new facility. This last link is now under study by the Maine State Highway Commission and is part of each alternate system for analysis purposes.

The central corridor would follow the same alignment from Amsterdam, N. Y. but would leave Interstate Route 87 in the vicinity of Glens Falls, New York and then proceed North and East on new location to the Vermont border in the Poultney area. From Poultney the route would proceed easterly to Rutland, Woodstock and finally tie into Interstate 89 near White River Junction, Vermont. From this point the corridor would utilize Interstate 89 across the Connecticut River to Lebanon, New Hampshire and from there

on new right-of-way easterly and northerly towards an interchange with Interstate 93 at Plymouth. It would continue on new location in a northeasterly direction skirting the edge of the White Mountains National Forest, serving the Conway area and crossing into Maine near Fryeburg. From Fryeburg the route would continue northeasterly through North Bridgton, Norway, South Paris, Wilton, Skowhegan and tie into Route 95 at Pittsfield. Again, this corridor would also include the link between Bangor and Calais.

The third and southernmost corridor is the earliest one proposed and would traverse the following general location. Starting at Amsterdam, New York, it would follow the thruway to Albany and thence easterly across the Vermont border to Bennington. From Bennington to Brattleboro the route would generally parallel Route 9; this link has already been planned as a future improvement to the Vermont arterial system. From Brattleboro the route would continue to parallel Route 9 to Keene, New Hampshire and from there in a northeasterly direction to tie into U. S. Route 202 in Henniker, New Hampshire. From this point, the corridor would utilize Route 202 and Interstate 89 to the Concord area, and then proceed on new location again in a northeasterly direction to the Rochester, New Hampshire area. From Rochester the route would cross the Maine border, serve the Sanford/Springvale area, and continue to the Gorham/Westbrook/Portland region finally joining the Maine Turnpike at Portland. This last piece between Gorham and the Turnpike could utilize the right-of-way for the proposed Portland/Westbrook arterial. This route would also incorporate a link from Bangor east to Calais on a new right-of-way.

Each of the three corridors then would provide a high-quality route from the Canadian border in the vicinity of Calais, Maine to Amsterdam, New York. Travel to and from the West would be accommodated by the New York Thruway.

Without extensive origin-destination information and elaborate network evaluation procedures it is not feasible to estimate the volume of traffic which might be attached to the highway if it were built. Without these data it is impossible, for example, to estimate the number of trips which might be diverted from the existing Interstate and toll road facilities (i.e., Massachusetts Turnpike, I-495,I-95) simply because nothing is known from either a quantitative or a qualitative standpoint about the existing trip numbers or patterns. At the same time it is useful at this point in the analysis to review existing traffic volumes on the major facilities in the

three corridors since they represent a primary source of traffic on any new highway. The figures quoted in the following paragraphs are average daily traffic volumes taken from maps supplied by the state highway departments. Given the recreational characteristics of the three northern states, it is likely that average summer volumes would be at least double the annual average.

Existing traffic volumes on Route 9 between Bennington and Brattleboro are in the range of 1,500 to 2,400 vehicles per day (ADT volumes). From Keene to Concord and Rochester this southern corridor now shows traffic volumes along Route 9 and Route 202 in the order of 3,800-4,800 vehicles per day, while volumes on the Maine link (i.e., Maine Route 4 and U. S. 202) now run between 1,500 and 3,000 vehicles per day.

The middle route in Vermont probably has the most traffic potential of the three corridors in that state. Existing volumes along Route 4 between Fairhaven, Vt. and White River Junction, Vt. vary between 1,700 and 5,500 vehicles per day. In New Hampshire this middle alignment from Hanover to Plymouth to North Conway now shows traffic volumes in the 2,000-2,500 vehicles per day range. Traffic volumes on the Maine segment of the middle corridor route are impossible to estimate, since no comparable facility parallels the entire proposed link.

The northern corridor in Vermont now shows traffic volumes in the order of 1,000-2,800 vehicles per day in the Montpelier/Barre to St. Johnsbury portion. In New Hampshire existing Routes 2 and 116 show traffic volumes in the order of 1,900-2,500 vehicles per day, and the Maine segment which parallels U. S. Route 2 is running in the order of 1,500-3,500 vehicles per day.

The volumes on the link between Bangor and Calais are apt to be quite low in the order of 1,000 vehicles per day. From a traffic standpoint no obvious advantages are readily apparent for any one of the three corridors. Some sections of each alternate corridor appear to have substantial traffic potential particularly during the summer months. Detailed analyses based upon origin-destination data and utilizing advanced computer oriented network evaluation techniques would be required for more definitive usage estimates.

It should be noted that the three corridors appear to be essentially non-competitive since they would serve different traffic movements with the exception of the

very long trips from western New York to central and eastern Maine which appear to be a relatively small proportion of any total usage. The northern corridor offers the advantages of a connection from Burlington, Vermont and the Lake Champlain region to the White Mountains National Forest in New Hampshire and eventually by means of a spur, to the Acadia National Park in Maine. Without a doubt, this corridor would provide the most scenic route and would offer considerable potential for recreation activities. The middle corridor has the advantage of a larger traffic potential in Vermont as well as a direct connection from the Saratoga-Glens Falls area to the Green Mountains and the White Mountains National Forest areas, once again, primarily to serve recreation travel. Since the southern corridor connects more population centers, traffic volumes on this route would probably be the highest. Both the portion between Bennington and Brattleboro in Vermont and the portion between Keene and Concord, New Hampshire have already been proposed and are part of long-range plans. Further, a substantial portion of existing facilities would be utilized in New Hampshire.

For purpose of comparison and general evaluation, cost approximations for each corridor section have been made. The cost estimates are for a 4-lane divided, controlled-access highway with interchanges at major highway routes and grade separations at all highway and railroad crossings.

These design standards were selected to form the basis for a cost estimate which would indicate the order of magnitude of the investment required for ultimate development of the highway facility. It is entirely possible that detailed study would suggest that portions of the route could be built as a high-type 2-lane road with provisions for expansion to 4 lanes. Total estimated cost for the East-West Highway is approximately $800 million to $1.1 billion depending upon the corridor.

A summary of the estimated cost of the three corridors and distance via each corridor is as follows:

Corridor	Construction Cost	Construction Miles	Travel Distance Amsterdam, N. Y. to Calais, Me.
Northern	$1,000,000,000	335	447
Middle	$1,100,000,000	369	411
Southern	$ 800,000,000	250	442

The existing expressway route from Amsterdam, New York to Bangor, Maine (Thruway, Massachusetts Turnpike, Route 495, Route 95) is 415 miles. The distance from Bangor to Calais, Maine, common to the three corridors above, is 81 miles. Assuming 60 mph travel speed, the saving in miles and time of the three corridors compared to the existing expressway system is therefore:

Corridor	Time in Minutes and Distance in Miles Saving over Existing Expressway
Northern	49
Middle	85
Southern	54

The diversity of the questions which must be answered in justifying this large an investment and the regional breadth of its scope suggest that the New England Regional Commission could provide a logical forum for more detailed study. The proposed facility is worthy of this further study but it should be evaluated within the broader context of the entire Regional Highway Network. Specifically, the following basic questions should be answered:

1. What is the traffic potential for the facility in terms of current and projected travel patterns and volumes? Which corridor has the largest potential?
2. What effect would the facility have on existing portions of the regional network, particularly the major tollroads?
3. What gross benefits would result to the users of the highway?
4. What gross economic effect would the highway have
   a) on industrial growth?
   b) on the tourist industry?
5. What effect would the projected investment in this project have on existing and planned highway programs at current spending levels?

4. The Long Island-New England Bridge

A bridge crossing of Long Island Sound between Long Island and New England has been the subject of considerable interest to the State of New York Department of Public Works. Feasibility studies were conducted by three consulting engineering firms to determine the revenue potential, interconnecting expressway requirements and construction cost and practicability.

Reports prepared for the New York State Department of Public Works indicate that several crossing sites were evaluated but only one, a crossing from East Marion, Long Island to Old Saybrook, Connecticut proved to be economically feasible. The major statistics for this crossing as developed in the reports are as follows:

Length of Bridge:			10 miles
Water depth up to:			150 feet
Span above navigable channel:			1,200 feet long 135 feet high
Traffic:	1973	5,900	vehicles per day
	1987	16,600	vehicles per day
	2009	27,800	vehicles per day
Construction Cost:			$206,000,000
Toll Charges:			$1.50 per axle
Anticipated Average Yearly Revenue			$ 22,094,000
Net Revenue after Maintenance & Operation			$ 20,594,000
Level Debt Service @ 4.5%			$ 13,950,000
Ratio - Av. Annual Revenue to Level Debt Service			1.47

One essential factor emphasized in the reports is the development of a suitable interconnecting expressway system to efficiently provide access to this crossing at both approaches. It was estimated that on Long Island, a so-called "Atlantic Expressway" would, over a period of years, require construction at a cost of $330,000,000. Along the other approach, a connection to the Connecticut

Turnpike would be required at a cost of $17,000,000.

One of the alternative routes studied would connect Orient Point, Long Island with Graves Neck, Rhode Island by way of Plum and Fisher Islands. This route was discounted as economically not feasible. From the reports, it appears that the bridge at this location would be 15.4 miles in length in addition to 9.2 miles of roadway along the islands and would cost a total of $420,000,000 to construct. In addition to the Atlantic Expressway construction that would be required on the Long Island approaches to this bridge, an extensive amount of new construction, alterations, and expansion of traffic facilities in Rhode Island would also be required to provide a suitable connection to the Interstate System.

While the feasibility analyses as presented in the reports found this route unsatisfactory from the viewpoint of a self-sustaining highway toll facility, it might be well to reconsider this route in terms of a dual service structure to carry both highway and high-speed rail vehicles. To be taken into consideration would be such factors as the directness of route, the economies of combined construction, the problems already in evidence in attempting to develop a satisfactory high-speed rail line through eastern Connecticut, and the potential funding advantages that might be realized in such an integrated system.

The consequences of a Long Island-New England bridge would be far-reaching. This project is not just a major water crossing, but rather an entirely new link in the ground transportation network of the northeast corridor and would effect substantial changes in travel patterns.

It is recommended that the Commission consider making a study to determine the effects of this project on New England and investigate the feasibility of a combined rail highway bridge.

H. HIGHWAY SAFETY

Motor vehicle deaths, injuries, and economic loss have been major elements of the price paid to operate the region's highway transport system for some time. In spite of a long-term trend of fatality rate improvement (i.e., number of deaths per unit of travel), the problem has grown dramatically in absolute terms during the first half of the decade. Deaths in New England as a result of motor vehicle traffic accidents increased by almost 42% (see Exhibit III-27) from 1960 to 1965 and approached 2,000 fatalities at the end of the period.

EXHIBIT III-27

Automobile Deaths in New England,
1960 and 1965

Area	Deaths from Motor Vehicle Accidents 1960	1965	% Increase 1960-1965
Connecticut	303	439	44.9
Maine	181	216	19.3
Massachusetts	621	905	45.7
New Hampshire	103	138	34.0
Rhode Island	60	115	91.7
Vermont	104	131	26.0
New England	1,372	1,944	41.6
United States	38,137	49,163	28.9

Source: National Safety Council, Accident Facts, 1961 and 1966 Editions.

Nationally, traffic deaths rose about 29% during the same period and resulted in the passage of Federal legislation aimed at stimulating greater effort in automotive and highway safety by all levels of government and private industry as well.

At the present time, the National Highway Safety Bureau, established by 1966 legislation, has formulated standards for state safety programs and is in the process of preparing formal manuals to guide the implementation of these standards.

It is interesting to note that here again, a large part of the total problem is in urban areas. In Maine, for example, of all the accidents occurring on the State and Federal Aid Highway Systems in 1966, 52% were located in urban environments which accounted for only 10% of the system mileage. The concentration of accidents within the region's urban places is another reflection of the low efficiency level at which the urban networks are operating.

The state programs as they relate to the highway departments have emphasized the improvement of accident location, reporting techniques, and records systems, since these are key elements both in the identification of high-frequency accident locations and the process of relating environmental variables to accident frequency. Funding of the overall programs has been at a level greatly reduced from that authorized by Congress in the legislation, and the New England Regional Commission should lend its good offices to the further intensification of the programs at Federal, state, and local levels.

I. THE "AFTER INTERSTATE" PROGRAM

With the end of the interstate program delayed but in sight, State Highway Departments and the Bureau of Public Roads are studying existing system deficiencies and future highway needs to prepare the after interstate highway programs and budgets.

The after interstate construction will of necessity emphasize programs for relieving urban congestion and balancing the relatively large proportion of expenditures of Federal funds on rural highways in the interstate period.

Secondary road systems will also require a much

larger share of the highway budget in future programs because of the past concentration of funds on interstate and primary systems and also because of the new role of the secondary system as feeders to the interstate and primary systems.

Maintenance costs are a major portion of annual highway outlays. They include costs of physical work to preserve the highway in good functional condition, and the costs of traffic control and services, such as snow, ice, weed control, mowing, etc., and traffic operations. The cost of these operations has been steadily increasing at a rate well over 5% per year for at least the past 12 years and can be expected to increase at an ever greater rate over the next decade.

Most of the highway departments have attempted to reduce maintenance on highways built during recent years by improving design practices, construction procedures, and materials. Nevertheless, total maintenance workloads of new highways have increased steadily. The resson for this increase is that the reductions in workloads as a result of better design, construction, and materials have been more than offset by increases arising from more safety features, beautification, higher standards, and expanded services for highway users. These same factors have caused substantial increases in the maintenance workloads for older highways. In addition, many older roads were not built to carry their present traffic load. Consequently, extensive work has been required to avert failure in structural components.

Maintenance is a major function of highway departments regardless of their size or area of responsibility. Indications are that it will continue to be a major function despite advances in design, construction, and materials.

According to the 1968 National Highway Needs Report, yearly maintenance and administration costs during the 1973-1985 period will exceed the 1965 costs by over 55% and will require nearly half of the total income available for highways, assuming that the current rate of increase of available highway funds is maintained. A recent study of maintenance requirements for the interstate system indicates that by 1975, the cost of pavement and shoulder maintenance alone will increase threefold.

Although there are research and development projects currently underway to find ways to improve the efficiency

of maintenance operations, it is doubtful that the total annual maintenance costs can be greatly reduced. It appears evident that maintenance will continue to demand more and more of the highway dollar.

The <u>1968 National Highway Needs Report</u> prepared for the Bureau of Public Roads indicates the projected available state and Federal revenues currently considered to become available for highway purposes will be only 65% of the amount needed during the 1973 to 1985 period. While the needs outlined in this report are debatable and will undoubtedly be revised after more detailed analysis, the problem of financing an adequate program and the portion of the tax dollar available for highway transportation needs are major considerations to be determined for the after interstate program.

The increased expenditures for highways in urban areas in the sixties has already made clear that road construction cannot be planned or built based on traffic and engineering considerations only. In the congested urban areas spatial priorities, sociological concerns, the tax base, and local community goals must all become part of highway planning and design. The comprehensive study of the effectiveness and the role of the various transportation modes also becomes essential in urban transportation construction.

The creation of the Department of Transportation by the Federal Government has both recognized and stimulated the need to plan transportation on an intermodal basis. Such current studies are being conducted by the Baltimore Planning Project and the Massachusetts State Highway Department on the Inner Belt recognizing the need to integrate highway planning with spatial and sociological priorities and needs. The systems approach to highway planning will need to be greatly progressed in the next few years to formulate and finance an adequate highway program for the after interstate period.

In industry, the role of transportation as one element in the production and cost of specific goods has been clearly recognized for many years. Government on the Federal, regional, state and local levels increasingly must include highway transportation as one element in the planning and construction of cultural, recreational, medical, educational and other public facilities.

J. FUTURE DEMAND

1. <u>Peak Season Motor Vehicle Population</u>

The following section presents data which reflect

peak season residential and motor vehicle population and travel demand potentials. The data may be used to prepare probable regional traffic analyses and projections with the county as a building block. The seasonal population factors include the impact of seasonal or second home, the visits of friends and relatives, the guests of lodging places, and the impact of outdoor recreation visitors. A factor has been allowed for supporting commercial vehicles required to serve the combined needs of the residential and seasonal population. These data become the base on which to forecast daytime movements of peak population counts.

Population figures by county for 1960 are provided by the census. A recent study by Arthur D. Little, Inc. has forecast 1980 figures. These have been interpolated to show 1966 figures, which were then slightly adjusted to agree with actual 1966 state totals.

Automobiles "available" (i.e., garaged) for 1960 are shown in the census. These are slightly adjusted to agree with state total automobile registrations. Occupied year-round dwelling and seasonal homes are enumerated in the 1960 census.

The annual automobile growth rate for the region, 1959-1966 (from registration totals), is related to the annual population growth forecast by the Arthur D. Little, Inc. study. By application of this ratio, a forecast of 1980 "available" automobiles in each county results.

The proportion of travellers visiting friends and relatives is known from the 1963 travel census. Applying this to a total number of visitors during July and August available from a previous study and translating it into vehicles by the 2.272 ratio of the 1963 travel census gives us a number of visiting automobiles related to dwellings. Multiplying this by the 5.44-day average stay of visitors (from the 1963 travel census) gives the number of automobiles on hand at total dwellings on an average day during the peak July - August period. Since seasonal homes attract travellers more than year-round homes at a known ratio, the figures are weighted accordingly.

Automobiles attracted by lodging places and recreational facilities are related to travellers by a known general ratio of size of party. Travellers are related to lodging and recreational dollar receipts by specific ratios for each county. Other automobiles attracted to

outdoor recreation pursuits have been estimated according to national trends and allocated to each county by a ratio of population density to land and water. Commercial vehicles are accounted for by a flat percentage of the number of automobiles.

The result is the number of motor vehicles expected to remain overnight in each county in 1980, shown in Exhibit III-28. Exhibit III-29 shows the ratio of additional seasonal automobiles to those registered.

2. Recommendations

a. Suitable land areas to develop future and to expand existing facilities are critically short, particularly in densely populated areas of New England. It is recommended that state and local governments consider adopting policies, legislative and/or constitutional amendments to allow the taxation of land in accordance with principles of land use. These land use principles should encourage the preservation of right-of-way zones for such transportation facilities as primary and connector highways, airport approach zones, and airport expansion areas. Any substantive changes in land use which conflict with the eventual public needs would under such law cause the owner to pay substantial tax penalties. Connecticut has adopted and successfully used such concepts. New Hampshire has before the electorate a constitutional amendment to allow the adoption of such taxation policies.

b. It is further recommended that the New England Regional Commission sponsor a special tabulation by the Bureau of the Census of the 1963 and 1967 Censuses of Transportation - Passenger Transportation Survey. Such a tabulation of 1963 data for New England was done by the Bureau of the Census for private enterprise, but it is incomplete. The proposed analysis should develop measures of change in passenger transportation between 1963 and 1967, as well as expand, where possible, information concerning travellers' use of transportation. These 1963 and 1967 data when published should be correlated with data developed by highway, aeronautics and other groups including public utility commissions. Such special tabulation should be repeated at regular intervals.

Exhibit III-28

Forecast of Probable Peak Season Motor Vehicle Population, New England, by County, 1966 and 1980

County	Estimated Total Motor Vehicles 1966	1980	Percent Growth 1966-1980
Connecticut			
Fairfield	350,176	533,259	52.2
Hartford	317,516	494,082	55.8
Litchfield	74,266	114,446	54.1
Middlesex	56,070	88,826	58.4
New Haven	302,728	460,341	52.1
New London	93,407	137,578	47.2
Tolland	32,929	47,999	45.8
Windham	34,417	49,929	45.1
Maine			
Androscoggin	31,030	38,620	24.5
Aroostook	38,679	48,019	24.1
Cumberland	88,700	116,933	31.8
Franklin	13,977	19,417	38.9
Hancock	28,203	39,422	39.7
Kennebec	38,885	50,634	30.2
Knox	16,321	22,069	35.2
Lincoln	16,862	24,544	45.6
Oxford	25,393	34,239	34.8
Penobscot	50,418	62,345	23.7
Piscataquis	16,165	21,033	30.1
Sagadahoc	10,927	14,339	31.2
Somerset	21,611	28,050	29.8
Waldo	13,754	18,410	33.9
Washington	21,547	27,810	29.1
York	58,789	81,775	39.1
Massachusetts			
Barnstable	98,687	156,592	58.7
Berkshire	69,926	100,258	43.4
Bristol	145,810	185,861	27.5
Dukes	8,505	13,416	57.7
Essex	218,466	282,317	29.2
Franklin	24,712	31,279	26.6
Hampden	157,348	201,904	28.3
Hampshire	40,459	52,744	30.4
Middlesex	442,938	563,373	27.2
Nantucket	4,373	6,810	55.7
Norfolk	238,861	272,745	14.2
Plymouth	140,934	170,617	21.1
Suffolk	241,176	278,709	15.7
Worcester	244,105	280,865	15.1

EXHIBIT III-28 (Continued)

Forecast of Probable Peak Season Motor Vehicle Population, New England, by County, 1966 and 1980

County	Estimated Total Motor Vehicles 1966	Estimated Total Motor Vehicles 1980	Percent Growth 1966-1980
New Hampshire			
Belknap	22,337	34,675	55.2
Carroll	24,487	39,189	60.0
Cheshire	26,635	40,323	51.3
Coos	19,947	28,736	44.1
Grafton	34,469	51,340	48.9
Hillsborough	74,637	111,329	49.2
Merrimack	37,364	56,812	52.1
Rockingham	64,032	98,985	54.6
Strafford	28,328	42,421	49.7
Sullivan	14,472	21,843	50.9
Rhode Island			
Bristol	18,019	22,926	27.2
Kent	50,691	65,058	28.3
Newport	35,338	46,547	31.7
Providence	224,310	282,036	25.7
Washington	37,158	51,860	39.6
Vermont			
Addison	12,012	17,102	42.4
Bennington	15,172	21,646	42.7
Caledonia	9,900	12,680	28.1
Chittenden	29,863	40,355	35.1
Essex	4,022	5,439	35.2
Franklin	12,944	17,684	36.6
Grand Isle	3,986	5,848	46.7
Lamoille	8,293	12,344	48.8
Orange	9,781	13,442	37.4
Orleans	11,252	15,731	39.8
Rutland	22,478	31,098	38.3
Washington	19,510	26,696	36.8
Windham	16,709	24,023	43.8
Windsor	22,869	32,238	41.0

EXHIBIT III-29

Ratio of Probable Peak Additional Seasonal Motor Vehicles to Total Registered Motor Vehicles, New England, by County, 1966 and 1980, in Percents

County	Seasonal Motor Vehicles 1966	1980
Connecticut		
Fairfield	11.6	12.6
Hartford	10.0	10.5
Litchfield	27.8	30.3
Middlesex	39.3	42.4
New Haven	11.1	11.8
New London	26.2	29.9
Tolland	16.0	18.1
Windham	13.2	14.8
Maine		
Androscoggin	23.8	30.7
Aroostook	46.5	57.4
Cumberland	49.7	67.4
Franklin	101.0	131.5
Hancock	135.2	172.5
Kennebec	44.5	59.5
Knox	66.2	86.4
Lincoln	148.9	200.4
Oxford	66.8	86.5
Penobscot	34.3	43.7
Piscataquis	185.1	207.5
Sagadahoc	45.2	58.0
Somerset	69.7	82.6
Waldo	56.2	73.3
Washington	81.4	94.0
York	81.2	113.6
Massachusetts		
Barnstable	234.7	293.8
Berkshire	39.9	48.7
Bristol	11.2	13.4
Dukes	247.0	306.1
Essex	16.2	19.7
Franklin	23.4	29.4
Hampden	14.6	17.5
Hampshire	20.7	25.7
Middlesex	10.3	11.9
Nantucket	190.4	235.4
Norfolk	12.9	15.6
Plymouth	40.1	52.2
Suffolk	22.4	26.9
Worcester	14.9	17.6

EXHIBIT III-29 (Continued)

Ratio of Probable Peak Additional Seasonal Motor Vehicles to Total Registered Motor Vehicles, New England, by County, 1966 and 1980, in Percents

County	Seasonal Motor Vehicles	
	1966	1980
New Hampshire		
Belknap	98.0	110.6
Carroll	225.8	256.9
Cheshire	42.6	47.6
Coos	64.4	75.3
Grafton	88.3	107.7
Hillsborough	16.5	18.2
Merrimack	41.4	46.2
Rockingham	58.5	66.6
Strafford	22.6	24.8
Sullivan	42.2	46.7
Rhode Island		
Bristol	12.4	15.4
Kent	16.4	20.5
Newport	28.7	36.8
Providence	10.1	11.7
Washington	61.4	81.8
Vermont		
Addison	83.0	103.9
Bennington	62.7	81.7
Caledonia	39.9	52.8
Chittenden	35.4	43.3
Essex	91.2	120.6
Franklin	48.5	58.8
Grand Isle	400.8	475.0
Lamoille	125.0	161.5
Orange	77.7	108.3
Orleans	62.5	77.8
Rutland	47.1	59.3
Washington	38.7	48.5
Windham	64.8	80.2
Windsor	39.5	49.5

3. Trends and Characteristics

a. Regional Trends

The development, production, distribution and expenditures of a region's resources are visibly interlinked with a region's transport systems. Transport activities on the systems and changes in such activities are measures of a region's economic growth. According to current corollary studies[1/] the New England population, which increased at an annual growth rate of 1.1% between 1960 and 1966, or from 10,300,000 persons to 11,224,000 persons, will increase at an annual average rate of growth of 1.3% per year through 1980 when the population is expected to be 13,800,000 persons. During the next two decades, employment is expected to increase at a 1.3% rate annually, and though the work week is expected to shorten, personal income in New England is expected to increase at an annual average of 3.6%.

While New England's population has been increasing at an annual average rate of growth of 1.1% per year since 1960, New England automobile ownership has increased at an annual average rate of 3.8%; New England highway vehicle travel has increased at an estimated average rate of almost 5.4% annually; and New England commercial airline arrivals and departures grew at an average annual rate of 15.3% annually between 1960 and 1966. Growth in motor vehical travel has increased at a rate almost five times the annual average population growth rate, and commercial airline passenger travel (not taking into consideration the rapidly expanding air taxi and private aircraft usage) has increased at a rate almost fourteen times the New England population growth rate. The Federal Aviation Administration estimates national true origin and destination air passenger movements at an 11% annual rate of growth. If this rate of projection were used, air passenger movements by 1985 would show a 7.2 fold increase.

When New England's population, motor vehicle registrations, motor vehicle travel, and commercial air passenger movements are projected, using current regional and national annual average rates of growth, serious shortcomings in the region's transport facilities and

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[1/] "Projective Economic Studies of New England," U. S. Army Engineer Division, Corps of Engineers, Waltham, Mass., by Arthur D. Little, Inc., Cambridge, Mass.

services are foreseen in areas of high population density. Regional action is required to fill these gaps. Within the next two decades, when the region's personal income will double, long-distance highway travel could increase an expected 2.85 times, and other modes of long-distance travel might increase at a slightly greater rate.

There are many reasons for projected growth in the modes of New England's several transportation systems. Some of the more obvious are:

1. An expanding gross national product with expected paralleling increases in New England's gross regional product;

2. increasing personal income;

3. earlier retirements;

4. increasing suburbanization and expected growth of new towns, and

5. increasing leisure time and leisure time travel.

Another factor is that New England, because of its heritage, its educational and medical centers, and its industrial and vacation centers, remains an important national and international visitor destination. In a 1966 national survey, four of the New England states ranked among the first twelve states as the destination national visitors desired most to visit again[1], with the respective states ranking as follows: New Hampshire, fifth; Maine, sixth; Vermont, eleventh; and Massachusetts, twelfth.

b. National Growth Trends in Inter-city Passenger Travel

A comparison of the national annual average rates of growth and change in the relative shares of inter-city United States passenger travel by mode of transportation provides a clue to a slight trend in more rapid growth of inter-city common carrier passenger service than corresponding inter-city service provided by the private automobile.

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[1] Gallup International, Inc., Gallup Vacation Travel Index, Princeton, N. J., 1966.

Exhibit III-30 indicates that nationwide, the common carriers' share of the total inter-city passenger travel market increased at an annual average rate of .9%. This increase from 10.0% to slightly more than 10.5% in six years of the national inter-city travel was at the expense of private automobiles. During the six-year period, 1959-60 to 1965-66, common carrier inter-city passenger travel increased in absolute terms at an average annual rate of growth of 3.2%.

On the other hand, intercity private automobile travel, according to data in Exhibit II-17 (p. 57) and Exhibit III-30, showed an average annual rate of growth of 3.1%. However, a slight downward trend in the private automobile share of inter-city travel is noted between 1959-60 and 1965-66 as the percentage share of the nation's inter-city passenger travel declined from 90% to 89.46%, or an average shift of minus 0.1 percentage points annually. It appears that growth in commercial air travel accounted for this shift.

Exhibit III-30 also shows that the railroad's national share of passenger traffic, when measured in miles of inter-city travel, has declined from 2.83% of total travel in 1959-60 to 1.86% in 1965-66. The airways' percentage share of domestic travel increased from 4.30% to 6.81% in the six-year period, which was the equivalent of an 8.0% annual average rate of change in the percentage share of the total traffic. On an absolute basis, airway passenger miles of travel increased at an average annual rate of growth of 11.5%.

c. The Transport System and Regional Needs

The four basic modes of transport - highway, rail, air, and water are both competitive and complementary. The means of transport on these modes in New England, as in the nation, are highly complex and sometimes complementary. This interplay can be seen by private, commercial and public use of the highway by autos, buses, trucks, and other vehicles; or by the private business, commercial, military and private use of the airways. Industry's continuing dependence on the use of rail and water to transport freight is established, and the highway and air competitive transport of persons as compared to rail and water passenger transport services is recognized. These factors are dynamic, and projected estimates of traffic demand indicate needs for major new facilities, services and transport systems.

EXHIBIT III-30

Comparison of Miles of Intercity U.S. Passenger Travel by Modes
Shares and Average Annual Rates of Relative Change and Growth*
Biennial Average, 1959/60 to 1965/66

Mode of Travel	Percentage of Total 1959/60	Percentage of Total 1965/66	Average Annual Rate Relative Change %	Average Annual Rate Growth %
Railroads and Electric Railways	2.83	1.86	(-5.0)	(-3.2)
Motor Carriers of Passengers	2.56	2.58	0.1	3.4
Inland Waterways	0.30	0.35	2.6	5.6
Commercial Airways (Domestic)	4.30	6.81	8.0	11.5
Total Common Carriers	10.00	10.54	0.9	3.2
Private Automobiles	90.00	89.46	(-0.1)	3.1
Grand Total	100.00	100.00	0.0	3.2

*Annual average rates of relative change and growth based on two-year moving average.

Source: Interstate Commerce Commission, Bureau of Economics, Transport Economics, November-December 1967, p. 8.

Viewed as a whole, the New England transport system's modes jointly provide the region with an essential economic intra-structure which in turn furnishes necessary economic services such as:

a. transport of raw materials to the producer;

b. transport of industrial products to the consumer;

c. transport of labor to centers of industrial production;

d. transport of the consumer to the product, including pleasure and travel; and,

e. transport for the protection of life, property and the development of future resources.

The economic need for some transport services is more clearly seen than that for others. For example, transport requirements for moving consumers to the product are frequently understated when computing a sub-region's transport needs. This is ironically true where a sub-region's economic base is principally travel service and related industries.

The dependency of the manufacturer on being able to have labor, as well as raw materials, arrive conveniently at the centers of production, or the dependency of retail establishments on being at a site readily accessible to the customer, is recognized. Travel service and related industries, such as resorts, recreation areas, and vacation destinations, are solely dependent on the transport of the consumer (the vacationer or the tourist) to the product of the industry rather than the transport of the industry product to the consumer. Since travel service industries are a substantial segment of some New England sub-area regional economies, competitive demands for transport systems historically result in seasonal peaks on existing transport facilities. Such peak demands for the region's transport services also have measurable effects on other industries' economic well-being. Over the years measures of peak demand periods have resulted in criteria upon which to forecast and plan public transport systems and facilities.

d. Characteristics of New England Travel

An examination of peak 1963 third-quarter travel in New England and a comparison of this travel with that of the nation gives a picture of the intermodal travel mix, and a comparison of this peak travel with the length of the trip and use of overnight lodging facilities provides a regional clue which is useful in establishing local estimates of the population of persons, travelers, and autos throughout the region. Data from the 1963 Bureau of the Census' "Passenger Transportation Survey", a part of the U. S. Census of Transportation, provides background information on travel involving trips of fifty miles or more.[1] The travel behavior of persons on long-distance trips helps explain the seasonal growth in regional demand on New England's transport services.

The 1963 tabulation of New England travel data showed at peak in the third quarter, with 33.9% of the trips and 41.8% of the travelers. Over two-thirds, 69%, of this travel was by New Englanders, while visitors from out of the region accounted for 31% of the long-distance travel. Transportation facilities must be designed for seasonal peaks. Data for New England seasonal travel by trip and travelers are shown below.

Quarter	Trips-%	Travelers-%
First	22.8	18.9
Second	21.2	19.4
Third	33.9	41.8
Fourth	22.0	19.9
	99.0	100.0

Source: Special Tabulation, 1963 Census of Transportation, Passenger Transportation Survey, U. S. Bureau of the Census, Washington, D. C.

[1] Definition of Trip: A trip is travel by one or more members of a household to and from (i.e. round trip) (a) an out-of-town place for overnight or longer, or (b) a place at least 100 miles away. Travel by crew members of transport vehicles, official travel of the armed forces and daytime commutation to and from work were excluded from this definition. (1963 Census of Transportation, Passenger Transportation Survey.)

Long-distance New England summer travel is substantially for extended periods of time. Only 4% of all trips to points over 50 miles distant are of one day's duration. During other seasons in 1963, the percentage of one-day trips increased to a peak of 12% for the first quarter, 6% for the second quarter, and 9% for the fourth quarter of the year.

It should be emphasized that though long-distance travel involving New England has a large component of vacation and pleasure travel, other purposes of such travel are equally significant. During the peak third quarter, 3.8% of New England travelers were on business; 37.7% were visiting friends and relatives; 49.5% were on vacations and other pleasure trips, and 9% were traveling for personal reasons. When travel is considered on a trip basis, the third quarter of 1963 trip data show that 6.6% of the trips were for business purposes, 38.4% were for visiting friends and relatives, 43.0% were for vacation or other holiday, and 12% were for personal reasons.

The following summarizes these data and shows the average number of persons in each travel party for New England trips:

	Trips %	Travelers %	Average No. in Party
Business	6.6	3.8	1.33
Visits to Friends and Relatives	38.4	37.7	2.27
Vacations and Other Pleasure	43.0	49.5	2.66
Personal	12.0	9.0	1.72
Total	100.0	100.0	2.32

Since travel is highly seasonal, a measure of the seasonal impact, in terms of duration of trip and type of overall lodging becomes important in determining the probable volume of persons in any given region of New England. Since only 4% of peak third-quarter interregional travel represents single-day trips, then the distribution of 96% of all travel, by traveler nights according to the type of lodging used, provides a New

England-wide measure of travel by lodging place. This distribution by lodging place use adds significance to local seasonal occupancy of (a) the vacation or second home; (b) the year-round dwelling of friends and relatives; (c) commercial lodging facilities, and (d) outdoor camping and similar recreational resources throughout New England.

Overnight lodging during the third quarter of 1963 was distributed as follows: 31% of New England travelers' nights were spent in commercial lodging places, 40% were spent with friends and relatives, 23% were spent in the traveler's own cabin, and 6% were spent elsewhere. By comparison with national averages, commercial lodging places and the travelers' own cabins played a more significant role in providing lodging in New England than elsewhere in the nation. The following summarizes these data for New England and the United States:

Lodging	New England	United States
Commercial	31%	26%
With Friends and Relatives	40	50
Own Cabins	23	13
Other	6	11
Total	100%	100%

Special attention is called to the fact that 38.4% of all trips, 37.7% of all travelers, and 40.0% of all traveler nights were spent with friends and relatives. The year-round home and the seasonal home are important visitor destinations which must be measured.

During the third quarter of 1963, 92% of all long-distance travel in New England was by automobile. The proportions by bus, air, rail and other means each were 2% of the total. During the first-quarter winter period of 1963, the travel proportions changed and 85% of the travelers traveled by auto, 1% by bus, 5% by air and 3% by railroad.

It might be noted that for the peak third quarter New England automobile travel was slightly higher than the national average, while New England air travel was 2% compared to 3% for the nation. This illustrates the lower demand for air travel for shorter distances.

The following compares the percentage shifts in the means of transportation by quarter during 1963 for New England with that of the nation.

Travelers	Quarter			
	1st (%)	2nd (%)	3rd (%)	4th (%)
New England				
Automobile	85	89	92	89
Bus	1	3	2	4
Air	5	3	2	2
Railroad	3	2	2	3
Other	6	3	2	2
Total	100	100	100	100
United States				
Automobile	87	89	91	89
Bus	3	3	2	3
Air	4	3	3	4
Railroad	3	2	2	2
Other	3	3	2	2
Total	100	100	100	100

Chapter IV
Aviation

A. SUMMARY

1. The various segments comprising the aviation industry and its associated activity contribute to the New England transportation system in the following ways:

a. The certificated airlines provide a means for rapid long haul interregional travel as well as limited intraregional travel between major population areas.

b. The third-level airlines provide service primarily between the region's airline hubs on the one hand and smaller communities throughout the six states on the other.

c. Charter and air taxi provide an "on call" type of service where and when required.

2. The airways system is essentially adequate to meet today's demands. The states and the New England Regional Commission must, however, continually monitor and encourage efforts to modernize the airways system to ensure its continuing adequacy.

3. The absolute number of airports within the region appears to be sufficient. Nevertheless, continuing efforts must be exerted to ensure that quality is also provided and maintained.

4. The airlines and general aviation will continue in their traditional functional roles for the foreseeable future.

5. Aviation is expected to continue to grow at a rate that outpaces most other sectors of the economy.

6. Basic traffic data needed properly to evaluate aviation and to plan for its future needs are currently available only from the certificated airlines. Furthermore, non-airline activity data are only available for those airports with a control tower or having an instrument approach and to a very limited degree from the various states. It is of the utmost urgency that methods be developed and an agency be charged with the responsibility of collecting operational data at all public airports. The magnitude of public expenditure that will be required to provide the aviation facilities of the future can no longer be committed on the basis of estimating activity, but must be substantiated by hard facts.

7. The effective solution of one of aviation's most pressing problems, airport ground access and congestion, can only be solved by utilizing the capabilities and resources of the surface modes of transportation.

B. RECOMMENDATIONS

1. Scheduled Airline Service

a. The New England Regional Commission and the states should jointly conduct detailed studies of the New England interregional and intraregional air service needs. Upon completion, these should be made fully available to both the certificated airlines and the third level operators in order both to encourage the orderly development of a viable third-level airline system and to form the basis for initiating regulatory proceedings for either new or improved certificated airline service where it is needed.

b. Efforts should continue to lessen the area's dependence on Boston and New York for interregional trunk line service.

(1) Airlines should be encouraged to alter route structures so as to provide single-plane service beyond the traditional terminating point in New York for other than Boston, Providence and Hartford service.

(2) New interregional operating rights should be awarded to the airlines as the demand for such service develops at the various New England markets.

c. Efforts should continue to improve the level of service at the smaller communities by local service and third level carriers, as traffic and demand mount.

d. The trunk airlines should be encouraged to provide intraregional service where such segments are economic in support of interregional routes.

2. General Aviation

a. The New England Regional Commission and the various states should encourage the development of a third level airline system within New England. Such an endeavor can and should be accomplished without the creation of new subsidy requirements.

b. The New England Regional Commission and the states should support the efforts of the third level airlines to assure operation of certain intraregional route segments now being operated by the trunks, where such a change would result in improved service.

c. A model study should be conducted to develop methods that could be utilized by the various states and communities to ascertain the cost versus benefits resulting from the expenditure of public funds required to develop facilities for the use of general aviation.

3. <u>Airways</u>

a. The New England Regional Commission should prevail on the FAA to assume responsibility for the operation of all non-federally-owned navigation aids which form part of the region's airways.

b. The Commission should endorse a policy whereby all navigation aids used in conjunction with the federal airways within the six-state area would be upgraded to at least a VORTAC capability.

c. The states and the Commission should support the efforts of the FAA continually to modernize and upgrade the capability and capacity of the airways and the air traffic control system.

d. Steps should be taken to establish a voice radio communication capability in the remote areas of the region.

4. <u>Airports</u>

a. Concurrently with the evaluation of general aviation, a regional airport master plan should be prepared. Specific areas of study should include:

(1) Evaluation of the present functional role performed by the publicly-owned airports within the six-state region.

(2) The socio-economic contribution of the various publicly-owned airports.

(3) Areas where public airports need to be constructed.

(4) The establishment of uniform criteria to ensure adequate facilities throughout the region's airports.

(5) The selection of those public airports that are determined to be necessary in order to comprise a "Regional Airport System."

b. A "Regional Airport System" should be established.

(1) Airports so designated and included in this plan should be those deemed vital to the <u>regional</u> transportation system. The establishment of a Regional Airport System should be undertaken at the earliest possible time but in order intelligently to deal with the airports serving the general aviation sector, other than third level airline operations, inclusion of these facilities should be held in abeyance until the evaluation of general aviation recommended is completed.

(2) Legislation should be sponsored by the New England Regional Commission that would allow a 90-10% federal and

state/local funding formula to be used for the development and improvement of those designated "Regional Airports."

(3) The absolute number of airports included in the National Airport Plan should be reduced and limited to those airports that are designated as "Regional Airports."

c. Airports that are not included in the regional airport system should be removed from the National Airport Plan and funding for their future development should be provided by the various state and local governments.

d. The New England Regional Commission should prevail upon the FAA to provide all the necessary air traffic control, approach instrumentation, and lighting facilities at those airports designated as "Regional Airports."

e. At public airports other than the "Regional Airports." the FAA should continue to install air navigation and traffic control facilities as the operational level warrants inclusion of such facilities in their improvement program.

5. General Policy

The institution of a 90% federal funding formula for Regional Airports should in itself free much local and state money that could then be concentrated on the development of the other publicly-owned airports throughout the New England area. In order to provide the necessary monies for such state/local undertakings, it is suggested that the New England Regional Commission convene a conference of the various state officials to discuss the desirability and feasibility of establishing user charges. The question of uniformity of such charges and the practicability of relating them to cost are prominent among the problems to be discussed.

C. GENERAL DISCUSSION

The purpose of this section is not to examine aviation in a vacuum, but rather to examine the contribution it makes to and role it plays in the transportation system of New England. Each of the various modes thus far examined has shown definite advantages as well as limitations in meeting these transportation demands. Aviation is no exception. Just as the private auto exhibits overwhelming advantages under a given set of circumstances, the aircraft will display similar tendencies when its operation is consistent with the role it is designed to fulfill. Before any judgement is attempted as to what the role of aviation is in the regional transportation system, it is necessary first to identify the functional categories of

aviation. Aviation activity and the aviation industry itself are divided into three broad segments, defined as follows:

1. <u>Airline</u>

The carriage of persons or property for hire. More specifically, the activity of the companies engaged in providing regulated, scheduled service under a certificate issued by the Federal Civil Aeronautics Board.

2. <u>Military</u>

All activity by the armed forces and government aircraft.

3. <u>General Aviation</u>

Broadly defined as any activity not fitting into either of the other two classifications. Includes air taxi, third level carriers, small aircraft charter, pleasure, business, instructional, agricultural application, and ferrying.

Airline activity is clearly a component of the public transportation system. Conversely, the activity of the military and other government aircraft do not play any role in public transportation and therefore have been excluded from further consideration except under the category of air traffic congestion. Some general aviation activity contributes to public transportation, while some (e.g., crop spraying) does not. This subject is discussed in greater depth later.

D. LIMITATIONS OF EXISTING DATA

Of the two categories of activity examined in this work, only the airline segment presents itself readily available for statistical scrutiny. The airline industry is highly competitive as well as being highly regulated. Through the desire to provide a competitive advantage to themselves and as a result of the stringent demands of the regulatory agencies, the carriers have amassed a vast amount of financial and operational data. One only has to look at the volumes of data presented both by airlines and other interested parties during the simplest of route cases heard before the Civil Aeronautics Board* to appreciate its magnitude and depth. However, when an attempt is made to evaluate the role of general aviation and its impact on a community or its contribution to a transportation system, it is apparent that there is no quick and readily accessible source of reference material.

*Civil Aeronautics Board: Federal body constituted to regulate air carriers in the United States.

The Federal Aviation Administration* and its predecessor agencies have endeavored to compile and assimilate statistical data relevant to general aviation. Unfortunately, they have had neither the manpower nor the funds necessary to provide the needed information. Most of their efforts have been directed toward the gathering of operational data at locations having federally-owned or maintained facilities. These efforts have provided vital stores of data pertaining to facilities that have been upgraded or improved, but corresponding data is woefully inadequate for locations that do not have federal control towers or navigation aids. Improved facilities cannot be programmed until it is proven that the activity warrants these improvements, by reaching and sustaining a certain degree of operational activity, but in many instances the operational activity cannot reach the necessary level due to the lack of the very facility being requested.

E. FUNCTIONAL ROLE OF AVIATION

Once the two aviation components that do render a transportation function are defined, it is necessary to identify the specific role to be fulfilled by the airlines and general aviation. The airlines are regulated by the Civil Aeronautics Board, and the regulatory function is manifested in the issuance of certificates authorizing the airlines to provide scheduled service between the cities named on the certificate. A level of service may be stipulated and the fares charged over these routes must be filed by the carrier with the Civil Aeronautics Board. The airlines do, however, exercise scheduling and equipment prerogatives over these routes. General aviation, on the other hand, is regulated and controlled by the Federal Aviation Administration. For the purpose of discussing a transportation system, aside from assurances of safety and crew qualifications, by far the most important regulations are Federal Air Regulation, Parts 91 and 135, which limit the size of the aircraft allowed to be operated by a non-certificated airline operator to 12,500 pounds. Examining an aircraft as a transportation vehicle, it can easily be seen that its chief attribute is the speed advantage it displays over any other type of vehicle. However, the speed advantage is only realized over longer distances. During short flights the inherent delays associated with aviation, whether it be checking in with an airline or the private pilot taking his aircraft out of the hangar and checking it over, completely negate the vehicle speed. In instances of less than approximately fifty to seventy-five miles, air trips would usually be

*Federal Aviation Administration: A body within the Department of Transportation responsible for the development and maintenance of the airway system as well as the establishing and enforcing of standards to insure air safety.

longer in duration door-to-door than surface trips. The illustration used in Exhibit IV-1 shows how erroneous is the assumption that air is always faster. In this example, the actual point of equal time is reached at sixty-seven miles (or one hour and thirty-seven minutes) under the conditions stated.

There are, however, other factors to be considered in judging air travel. Fares charged by airlines on short-haul flights are quite high in comparison to other modes. The average fare charged over six randomly selected New England city pairs in the fifty-to-seventy-seven-mile range was 16.1 cents per mile. Comparing this to the average per-mile cost of operating the private automobile of eight to ten cents, it is readily apparent that the aircraft is at a distinct disadvantage even though it is more direct. Due to the lack of patronage over short-segmented stage lengths, the level of service provided is usually quite low and this in itself acts as a further deterrent, for unless travel plans are quite definite and coincide with the schedule offered, the traveller is forced to seek an alternate mode. It then becomes apparent that it is unrealistic to expect airline service over routes where the stage length is less than approximately 100 miles, except perhaps as intermediate stops over a longer route or in special cases where water or wilderness intervene. This, in effect, is the pattern of New England airline service. The airline segment of the aviation industry should therefore be encouraged in the role of providing long-haul transportation linking New England with the other areas of the nation, as well as providing air transportation primarily between Boston and the medium-sized communities of the region.

F. THE AIRLINES IN NEW ENGLAND'S TRANSPORT SYSTEM

Long-haul transportation has been the historic role of the certificated airline industry within New England and should continue to be the major function in the future. However, it behooves the airline industry, the states, and the New England Regional Commission continually to monitor the emergence of other markets for their inclusion in interregional routes, thus eliminating the dependence on Boston, Hartford, and New York as gateway cities to and from New England. An example of such action is now being deliberated by the Civil Aeronautics Board in which the states of Maine, Vermont and New Hampshire are seeking direct air routes to the Great Lakes area. There appears to be sufficient justification for similar proceedings to be undertaken to improve the services in southern New England and thereby reduce this

Exhibit IV-1

TIMES TO ACCOMPLISH TRIPS OF VARYING DISTANCES VIA AIRCRAFT AND AUTOMOBILE

Length of Trip Via Air or Superhighway	25	50	75	100	200	400	600
Time in hours (h) and minutes (m) to complete various segments of the total trip. Time required to reach an airport or superhighway	15m	15m	15m	15m	15m	15m	15m
Time required to complete travel over distances given via:							
Aircraft*	10m	20m	30m	40m	55m	1h45m	3h40m
Automobile**	25m	50m	1h15m	1h40m	3h20m	6h40m	10h00m
Time required to proceed from an airport or the highway to the destination	15m	15m	15m	15m	15m	15m	15m
Delays encountered at the airport, park auto, purchase ticket, filing of flight plan, embark, disembark, claim baggage, etc. (20 minutes each airport)	40m	40m	40m	40m	40m	40m	40m
Total elapsed time via:							
Aircraft	1h20m	1h30m	1h40m	1h50m	2h05m	2h55m	4h50m
Automobile	55m	1h20m	1h45m	2h10m	3h50m	7h10m	10h30m

*Trip less than 100 miles aircraft speed 150 mph; greater than 100 miles, 225 mph.

**Speed of automobile on superhighway 60 mph.

Computed by Systems Analysis and Research Corporation

area's dependence on Hartford and New York. In order to ensure that airline service fills the area's travel needs and to lessen the congestion at the larger airline terminals of New England, a continuing effort should be made to establish additional or amend present routes so as to link the smaller communities of the area directly with points outside the New England region. Possible candidates for such action at this time would appear to be the linking of Portland, Manchester, and Worcester directly with Washington,D.C.

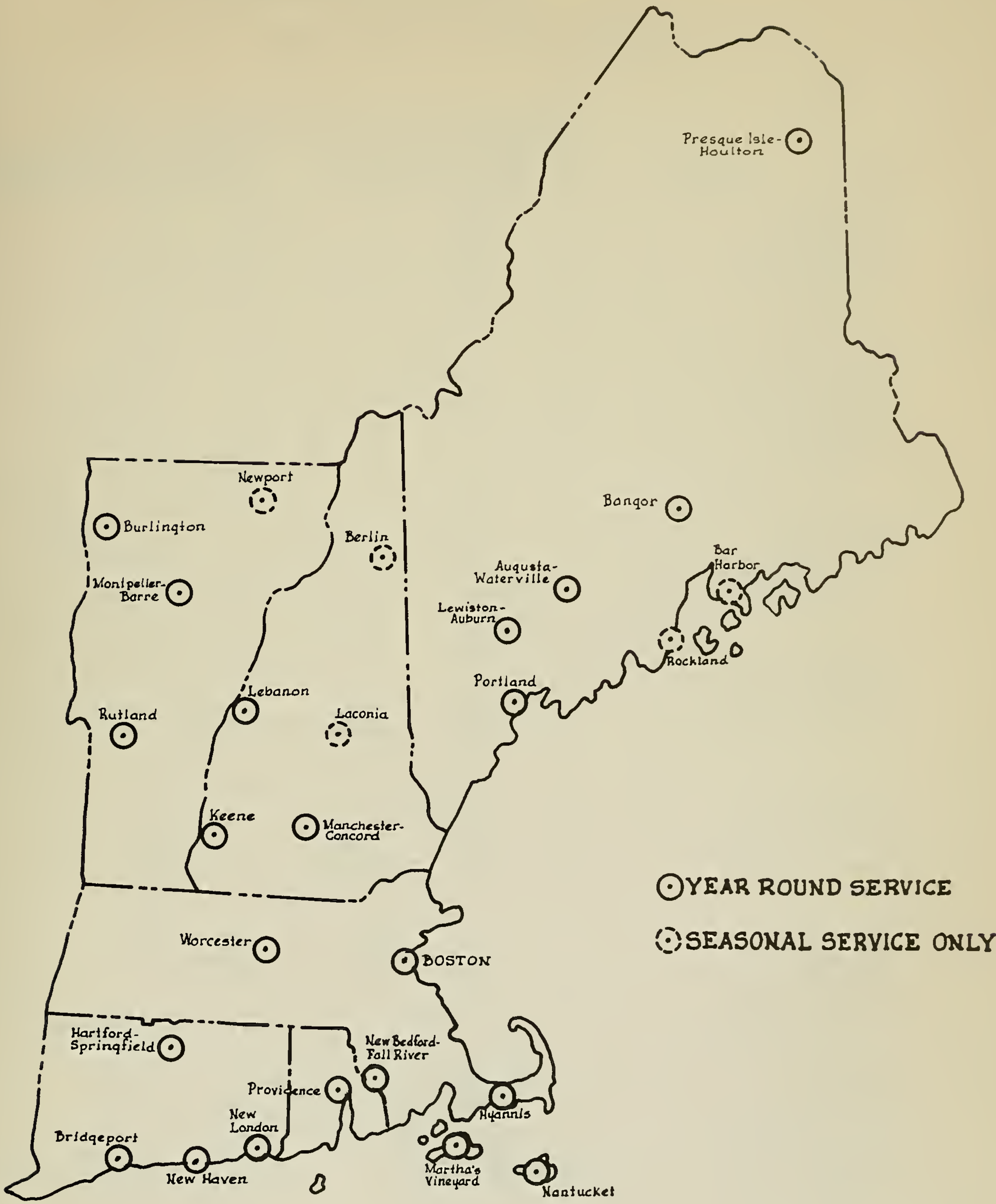
Map IV-1 depicts the present twenty-seven communities receiving airline service in New England. When this is used in conjunction with Exhibit IV-2, it becomes readily apparent that (1) the need exists for improvement in the directional opportunity afforded the New England air traveler, (2) there is a distinct lack of competition with 70% of the markets being served by single carriers and only three receiving service by more than two carriers and, (3) in other than three multi-carrier markets, there is complete dependence upon New York and/or Boston for connecting flights to and from New England.

Exhibit IV-3 shows the relationship of New England O&D passengers to total O&D passengers in 1966. After eliminating those passengers originating or terminating in Boston, there is relatively no New England intraregional air travel. An intra-New England route structure that would stimulate this type of travel simply does not exist. (See Maps IV-2 and IV-3) This lack of service is caused, in large part, by the relative closeness of the more highly populated areas. There are now twenty-seven communities certificated for airline service within New England, resulting in a possible 351 city pairs. Examining the 1966 O&D data it can be seen that only 119 city pairs in New England exchange passengers and that forty-seven of the 119 involved either Boston or Hartford. This volume of travel in itself is a tribute to the dedication of the air traveler within New England since only forty-five city pairs had through plane service and twenty-three of these were either to or from Boston (Exhibit IV-4)

Exhibit IV-5 depicts the actual 1966 O&D data and the intercity mileage between all possible New England city pairs. Even after excluding the relatively long segments involving the communities within the State of Maine, there still exists a substantial number of city pairs that have relatively long stage lengths. In fact, the average intercity mileage between all possible city pairs is 155.8 miles. It is not feasible to expect the scheduled certificated carriers to undertake such service, due to passenger load requirements of the equipment being utilized. However, the exploration of a possible latent intraregional air transportation demand appears to be warranted and will be considered in the discussion of third level airlines.

MAP IV-1

NEW ENGLAND AIRLINE AIRPORTS



SOURCE:

Book Of Official CAB Airline Route Maps And Airport To Airport Mileages, 12th Edition, Airline Tarriff Publisher Inc.

Exhibit IV-2

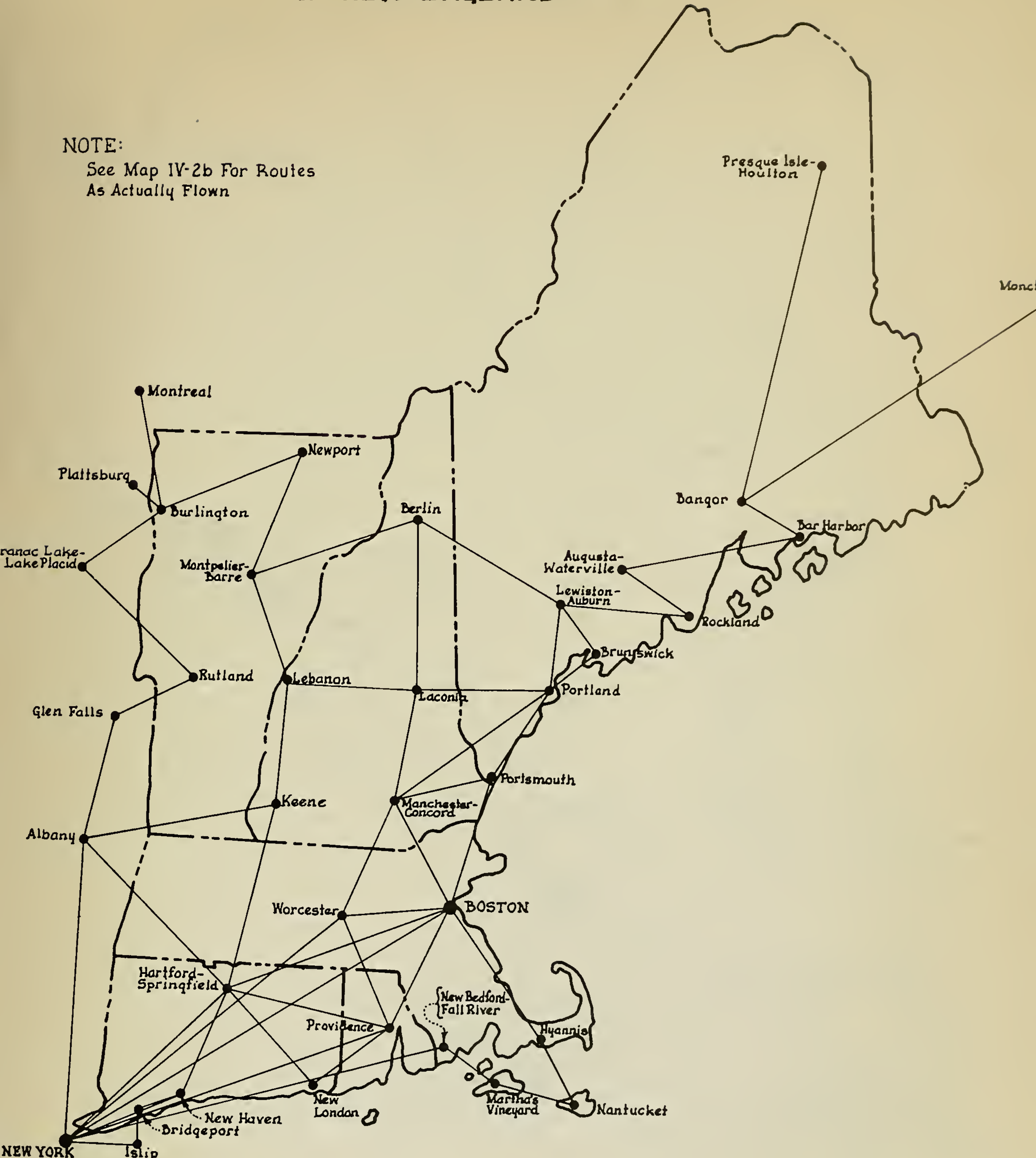
SERVICE AT NEW ENGLAND AIRLINE AIRPORTS

City	Service by			
	Certificated Carriers		Third Level Carriers	
	No.	Service Orientation**	No.	Service Orientation**
Augusta, Me.	1	N-S	1	N-S
Bangor, Me.	1	N-S	-	-
Bar Harbor, Me.	1*	N-S	-	-
Bedford, Ma.	-	-	2	N-S-E
Berlin, N.H.	1*	S	-	-
Block Island, R.I.	-	-	1	N
Boston, Ma.	15	Omni	5	Omni
Bridgeport, Conn.	1	N-S	-	-
Burlington, Vt.	2	N-S	2	S-E
Chatham, Ma.	-	-	1*	N
Hartford, Conn.	7	Omni	1	N-S
Hyannis, Ma.	1	N-S	1	S
Keene, N.H.	2	N-S/E-W	-	-
Laconia, N.H.	1*	N-S	-	-
Lewiston, Me.	1	N-S	1	S
Lebanon, N.H.	1	N-S	2	N-S-E-W
Manchester, N.H.	1	N-S	2	E-W-S
Martha's Vineyard, Ma.	1	N-S	1	E-N
Montpelier, Vt.	1	N-S	2	E-W-S
Morrisville, Vt.	-	-	1	E-W-S
Nantucket, Ma.	1	N-S	2	N-W
New Bedford, Ma.	1	S	-	-
New Haven, Conn.	2	N-S	1	E-W
New London, Conn.	1	N-S	1	W
Newport, R.I.	1*	S	2	N
Pittsfield, Ma.	-	-	1	S
Portland, Me.	1	N-S	2	N-S
Presque Isle, Me.	1	N-S	-	-
Providence, R.I.	6	Omni	2	S
Provincetown, Ma.	-	-	1	S-W
Rockland, Me.	1*	N-S	1	S
Rutland, Vt.	1	S-W	-	-
St. Johnsbury, Vt.	-	-	1	W-S
Waterville, Me.	-	-	1	S
Westerly, R.I.	-	-	1	S
Whitefield, N.H.	-	-	1*	S
Worcester, Ma.	2	N-S/E-W	-	-

*Seasonal service only
**Explanation of symbols: N - North; S - South; W - West; E - East; Omni - All directions.
SOURCE: Official Airline Guide, April 1, 1968. Telephone survey of third level carriers May 24, 27, 1968

MAP IV-2a
CERTIFICATED AIRLINE ROUTES IN NEW ENGLAND

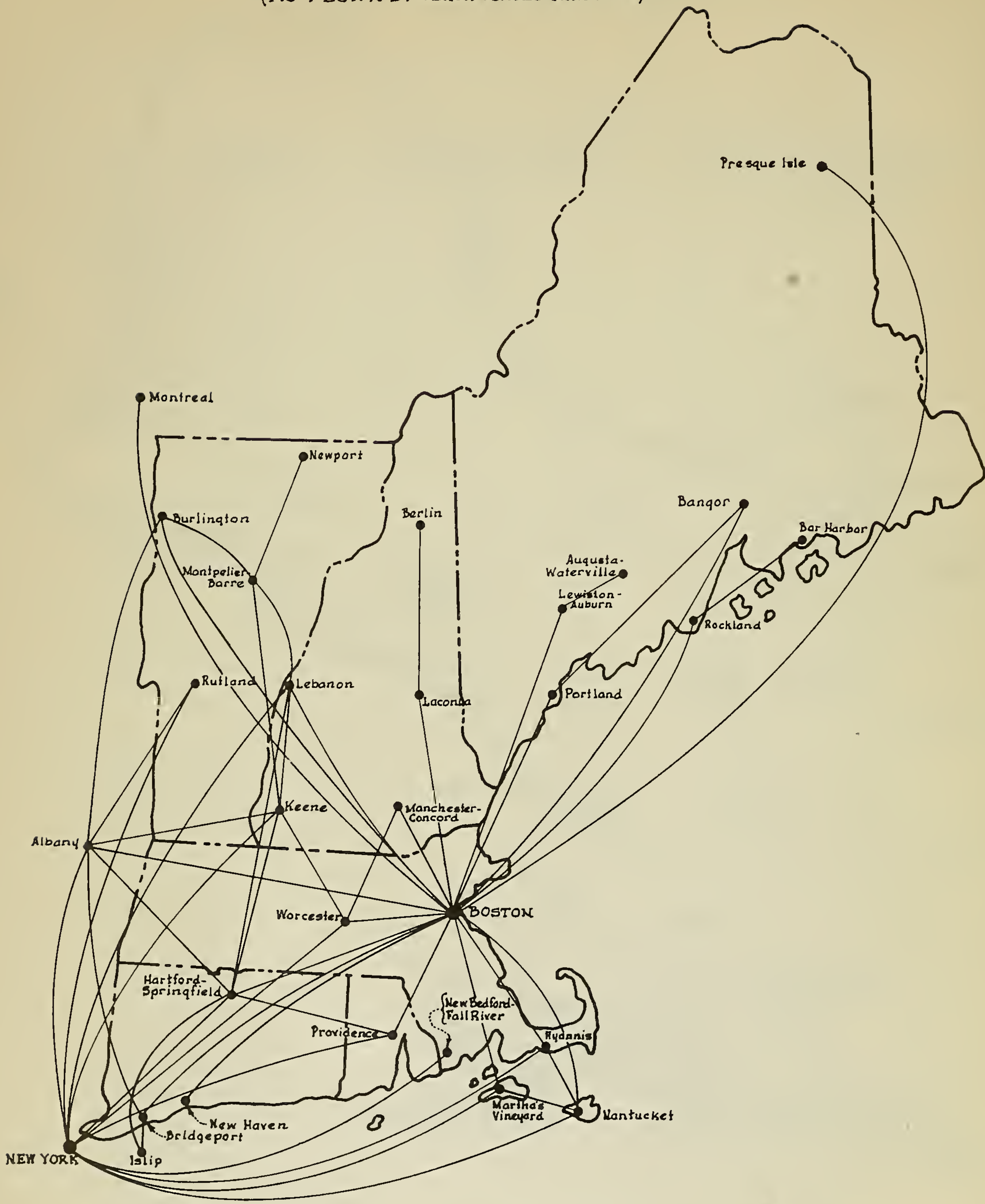
NOTE:
See Map IV-2b For Routes As Actually Flown



SOURCE:
(See Map IV-1)

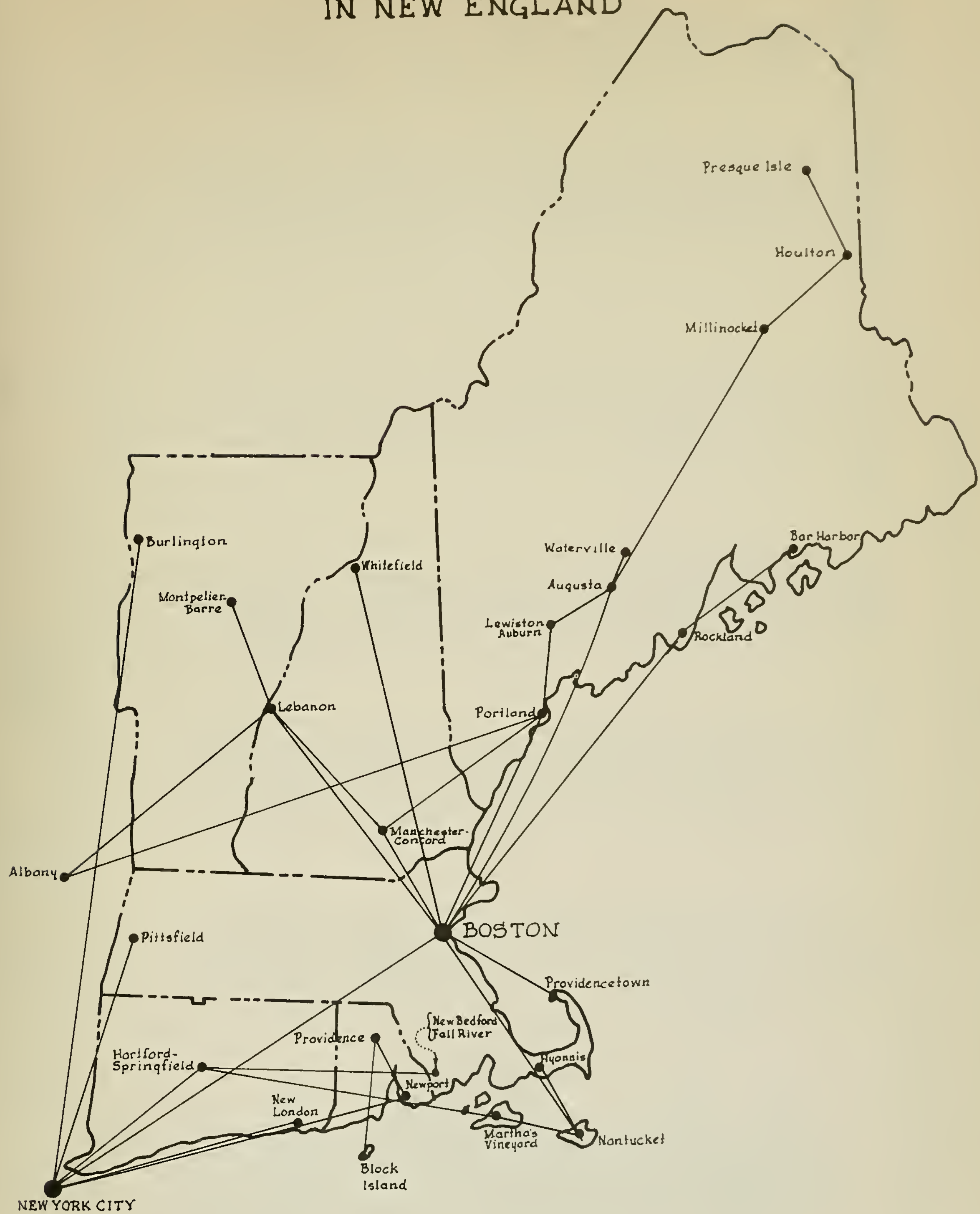
MAP IV-2b

NEW ENGLAND AIRLINE ROUTES
(As Flown By Certificated Airlines)



SOURCE:
Official Airline Guide May 1, 1968

MAP IV-3
THIRD LEVEL ROUTES IN NEW ENGLAND



SOURCE:
SARC - Phone Survey

Exhibit IV-3

1966 NEW ENGLAND AIRLINE PASSENGER DATA

	O&D*	N.E. O&D**	Boston O&D***	N.E O&D Less Boston†	Percent with N.E. O&D Total	Percent with N.E. O&D Less Boston
Augusta	21,240	9,370	9,100	270	44.11	1.27
Bangor	108,380	46,880	41,860	5,020	43.26	4.63
Bar Harbor	1,320	670	630	40	50.76	3.03
Berlin	650	210	210	—	32.31	—
Boston	5,208,310	183,710	NA	NA	3.53	NA
Bridgeport	44,440	14,890	14,300	590	33.51	1.33
Burlington	100,630	17,670	16,580	1,090	15.73	1.02
Hartford	994,890	24,320	18,170	6,150	2.44	.62
Hyannis	19,680	2,400	1,650	750	12.20	3.81
Keene	25,650	1,250	960	290	4.87	1.13
Laconia	3,400	870	850	20	25.59	.60
Lewiston	8,730	3,520	3,440	80	40.32	.92
Lebanon	36,300	4,440	4,180	260	12.23	.72
Manchester	36,210	1,640	1,480	160	4.53	.44
Martha's Vineyard	11,840	1,950	1,550	400	16.47	3.38
Montpelier	14,650	6,660	6,240	420	45.46	2.87
Nantucket	25,610	9,220	8,310	910	36.00	3.55
New Bedford	32,500	150	110	40	.46	.12
New Haven	16,630	2,110	1,970	140	12.69	.84
New London	55,730	1,330	1,010	320	2.39	.57
Newport	190	20	—	20	10.53	10.53
Portland	139,690	34,470	31,510	2,960	24.68	2.12
Presque Isle	35,210	18,550	14,290	4,260	52.68	12.10
Providence	534,110	7,370	3,960	3,410	1.38	.64
Rockland	2,130	690	670	20	32.39	.94
Rutland	2,470	10	10	—	.40	—
Worcester	54,610	900	670	230	1.65	.42
Total New England	7,535,200	395,270	183,710	27,850	5.25	.37

*These data are partially duplicated

**These data are fully duplicated (i.e., every passenger is shown twice, once in the "from" sense and again in the "to" sense).

***These data are unduplicated

†Column two less twice cclumn three

Exhibit IV-4

NEW ENGLAND COMMUNITIES WITH SINGLE-PLANE AIRLINE SERVICE
MAY 15, 1968

TO: FROM: ⟶	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1. Augusta/Waterville					x							x										x*	x*				
2. Bangor					x																	x	x				
3. Bar Harbor**					x																				x		
4. Berlin**					x						x																
5. Boston	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x			x	x	x	x		x
6. Bridgeport					x														x*								
7. Burlington					x								x			x											
8. Hartford					x					x			x	x*								x		x			
9. Hyannis					x										x		x										
10. Keene					x			x					x														x
11. Laconia**				x	x																						
12. Lewiston/Auburn	x				x																	x*	x*				
13. Lebanon/White River Jct.	x*				x		x	x		x				x		x						x*					
14. Manchester					x			x*					x*									x*					x
15. Martha's Vineyard					x				x								x										
16. Montpelier/Barre					x		x			x			x														
17. Nantucket					x			x	x						x												
18. New Bedford/Fall River																											
19. New Haven					x	x*														x*							
20. New London																			x*								
21. Newport, R.I.																								x*			
22. Portland	x	x			x			x*				x*	x*	x*									x*				
23. Presque Isle/Houlton	x	x			x							x*										x*					
24. Providence					x			x													x*						
25. Rockland**			x		x																						
26. Rutland																											
27. Worcester					x					x				x													
28. Newport, Vt.**																											

*Scheduled third level or air taxi
**Seasonal service only

Exhibit IV-5

New England Communities Exchanging Air Passengers in 1966

Intercity Mileage / 1966 O&D Passengers	AUG	BGR	BHB*	BML	BOS	BDR	BTV	BDL	HYA	EEN	LCI*	LEW	LEB	MHT	MVY	MPV	ACK	EWB	HVN	GON	EFK*	PWM	PQI	PVD	RKD*	RUT	ORH
Augusta		56	77	71	153	279	174	224	186	156	100	27	131	123	137	142	212	194	262	234	128	54	187	199	36	167	175
Bangor	10		41	119	204	340	220	278	230	239	161	88	191	183	188	192	252	244	322	297	169	107	134	251	52	223	232
Bar Harbor*				146	200	336	246	278	217	227	172	78	208	189	234	218	235	234	332	288	202	114	151	285	49	240	232
Berlin*					146	121	101	202	205	117	64	55	79	103	210	68	226	198	234	221	61	74	218	179	106	107	157
Boston	9,100	41,860	630	210		236	182	88	62	73	83	127	109	48	70	148	89	48	121	87	188	98	334	40	155	171	38
Bridgeport	90	90			14,300		235	58	152	128	191	269	177	153	137	214	159	121	15	58	264	190	465	104	290	167	104
Burlington	20	50			16,580	10		177	246	117	111	153	73	136	247	37	271	181	219	238	59	158	294	204	206	63	168
Hartford	160	1,060	30		18,170	60	520		126	71	126	191	119	94	117	157	144	90	45	50	208	171	405	65	243	128	47
Hyannis		20			1,650	10		70		135	143	168	172	112	24	215	27	35	138	97	246	138	365	61	87	192	90
Keene		10			960			190			57	133	49	44	123	113	159	114	117	112	139	114	335	87	179	59	52
Laconia*					850	10		10				76	40	38	149	76	171	135	170	154	107	61	285	118	113	76	91
Lewiston					3,440	10		30					107	111	183	121	195	174	238	212	116	50	209	212	53	168	150
Lebanon					4,180	10	60	150	10	50				60	174	46	196	156	165	159	88	99	295	158	163	37	99
Manchester					1,480			20							114	99	136	95	136	119	142	88	308	79	144	90	53
Martha's Vineyard					1,550			40	80	10						161	31	24	122	81	256	154	384	40	198	193	85
Montpelier	10	20			6,240		50	250		20							237	198	201	203	52	122	278	181	172	51	144
Nantucket	10	10			8,310	10	20	40	510						250	30		50	146	103	274	164	386	78	201	215	110
New Bedford					110														107	70	242	143	376	25	190	170	61
New Haven	10	20			1,970	10		10												42	252	216	442	86	273	158	85
New London		30			1,010	30	10	50					20			10					248	182	421	48	245	164	64
Newport*								10														132	238	218	264	100	188
Portland	20	800			31,510	180	20	800	30					10			50	20	80	150			235	145	66	136	124
Presque Isle		2,750			14,290	70	10	770	10										10			630		366	187	314	359
Providence	40	150			3,960		300	2630				20	20			30	20	20	20	20	10	130	10		196	147	36
Rockland*					670								10													196	188
Rutland			10		10																						111
Worcester					670		20	10	10			20	30	130								40					

*Seasonal service only

Exhibit IV-5

The newer highway system in being and proposed appears on the surface to satisfy the intra-New England transportation demands. Nonetheless, if any attempt is to be made to develop the economic and tourist potential within all of New England, a means must be provided that will allow rapid and modern access to all the various parts of the area.

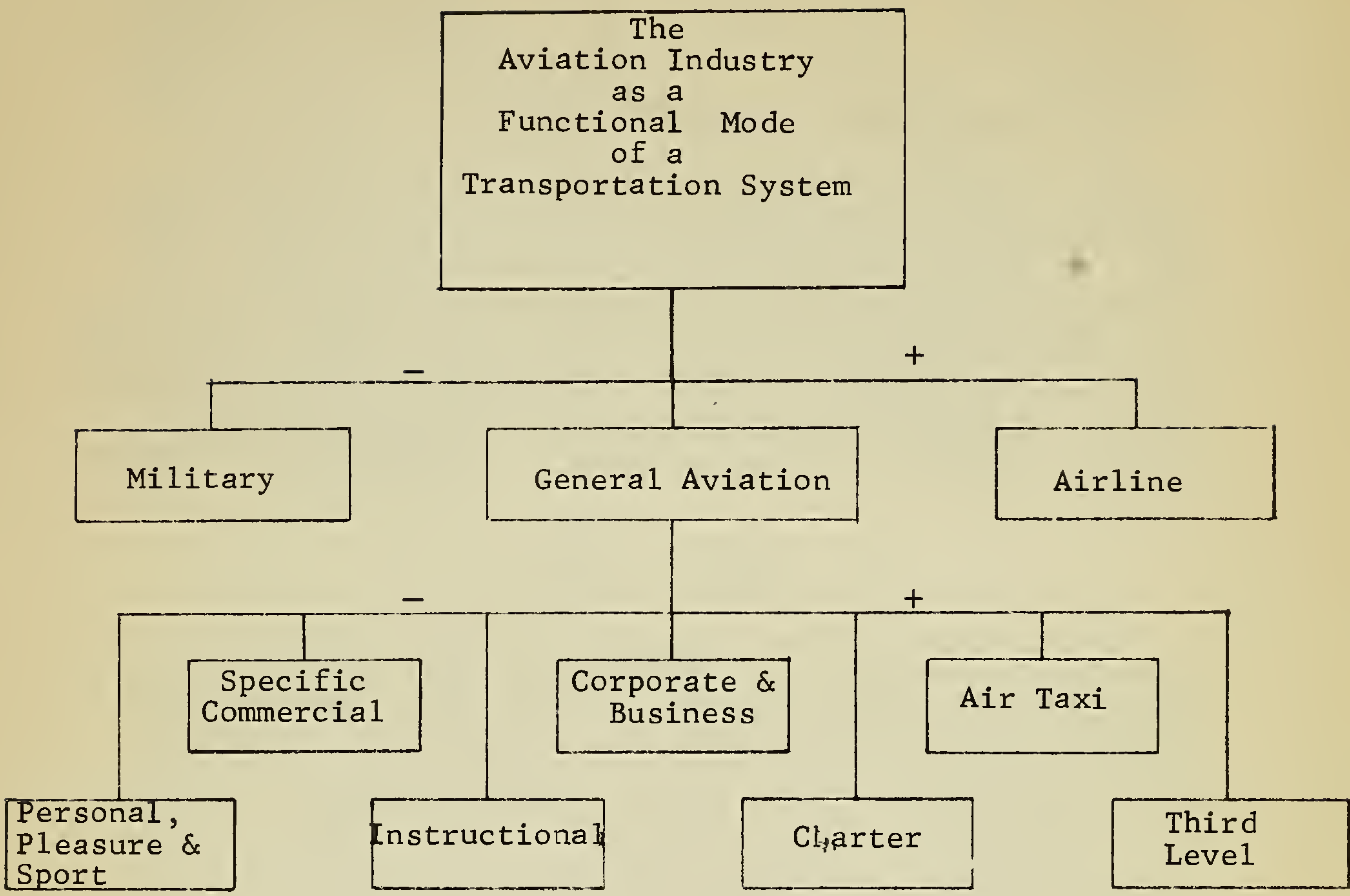
There may well exist a need for service of this type, however it is not considered compatible with the modus operandi of the airline segment of the aviation industry. Because of the almost inevitable requirement for subsidy, it is not necessarily wise to require the certificated airlines to provide service in these relatively low traffic generating and short stage-length markets. Short-haul service is expensive for a long-haul scheduled airline to provide, primarily because of labor and overhead costs. The short-haul role, however, could be adequately handled by the general aviation industry.

G. GENERAL AVIATION

As indicated earlier, general aviation is the title given to many diverse activities. In many instances, the components of general aviation actually have conflicting interests, and certainly different requirements. The fixed base operation or the third level airline does not require runways as long as those needed to operate today's business jet. The very existence of company-owned aircraft deprives the fixed base or third level operator of a prime source of income. Scanning the various aircraft that operate in this category makes the complexity of any evaluation of general aviation apparent. The spectrum of aircraft ranges from one home-built from a kit available from a mail order house to four-engine, turbine-powered aircraft that a few years ago were used in airline service. The requirements of these disparate types are obviously quite different. It then becomes apparent that further examination and delineation of acitivity is necessary to assess the value and the role of general aviation in a public transportation system. It is not the intent of this study to dwell unnecessarily on general aviation, but rather to focus on those areas that do constructively contribute to a regional transportation network. To identify this function, it is necessary further to subdivide general aviation into functional segments. This has been done in Exhibit IV-6, which also places these segments relative to each other as their role as a public transportation vehicle increases.

Some point of departure is necessary in order to focus on what contributes to the regional transportation system

Exhibit IV-6



(+) = Contributes materially to Public Transportation

(–) = Does not contribute materially to Public Transportation

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SOURCE: Systems Analysis and Research Corporation

and what does not. In the interest of expediency and clarity, the following definitions of different types of flying are used:

1. Personal, Pleasure and Sport

   The operation of an aircraft solely for the pleasure or convenience of the operator whereby he derives only personal benefit from such operation.

2. Specific Commercial

   Agricultural flying, transmission line patrol, fire patrol, helicopter lifts, etc.

3. Instructional

   The operation of an aircraft for training purposes ranging from the novice aviator's first dual flight to the airline captain on his semi-annual route check.

4. Corporate and Business

   The operation of the privately-owned or leased aircraft for the transportation of persons or property solely for the economic benefits of the operator of the aircraft.

5. Charter

   The commercial operation of aircraft for hire.

6. Air Taxi

   The commercial operation of aircraft for hire by an operator who has joined in association with other operators and advised the general public of this service through advertising in various national and regional publications.

7. Third Level

   An unregulated airline operation providing scheduled service between two or more specific points. Sometimes called scheduled air taxi.

The objective of these definitions is to identify the aircraft activity and its associated contribution to the transportation system, rather than to stereotype the aircraft itself by confining it to one or more of the defined areas. Thus it is readily seen that the circumstances of a particular flight will dictate its impact on the regional transportation system. It would follow that certain general aviation activities clearly fall within the scope of governmental interest relevant to public transportation. The ultimate decision of

what is and is not public concern rests with the governmental body called upon to render monetary assistance or policy guidance. Just as a state must choose and limit its assistance to those situations within its bounds that affect the entire state, or whose presence will so burden a particular area that the problem will manifest itself in other ways upon the whole state, the New England Regional Commission, representing not one but all six states, must confine its efforts to similar guidelines relating to the region as a whole.

When one considers general aviation as a separate component, competing with other modes in the transportation system for public funds, it becomes quite obvious that the various sub-categories contribute to the system in widely varying degrees.

The first three types of flying defined above appear to play no role in public transportation, personal, pleasure and sport; specific commercial; and instructional. It could be argued that these do, in fact, contribute to the local or regional transportation network; however, putting these activities to the test of whether the general public can avail itself of them clearly indicates that they are irrelevant when considering the relation of the total transportation system to the needs of the region.

Three other types -- charter, air taxi and third level -- do contribute in varying degrees to meet the demands of the traveling public. Although air taxi and charter were shown as two separate segments of general aviation, this is more a matter of degree of accessibility than reference to the nature of the operation itself. General speaking, the knowledge that air charter is available is limited to the area in which it exists. It therefore may play a vital role in a specific community, but the general public outside of the immediate area could very well be unaware of its existence. Air taxi operators, on the other hand, call the public's attention to their existence through various associations and advertising and promotional programs. A potential New England air traveler in California can gain specific knowledge of the existence of air taxi operators in New England through any travel agent or airline ticket office.

H. THIRD LEVEL AIRLINES

Third level airlines definitely do contribute to the region's transportation system. As discussed earlier, the airline industry is continuously evolving and, although its very existence is regulated, it does have the opportunity to exercise equipment choices and, through procedural recourse,

can curtail service on its less profitable segments. In the quest for relative strength within the industry, this usually means a continuing re-equipment program involving newer, faster and larger aircraft. As this occurs, the smaller communities, who generate few passengers to begin with, are placed in a less advantageous position with the advent of new equipment requiring larger passenger loads.

Continuing through successive re-equipment cycles, the small, less profitable communities began to become a real economic burden on the scheduled airlines, and it is not uncommon for the Civil Aeronautics Board to grant the carriers' requests that they be allowed to discontinue service. One only has to view the results of the New England Regional Airport Investigation of 1962 to note that prior to this hearing there were forty-one certificated points in New England either receiving airline service or for which service was authorized, pending the availability of suitable airports. In 1968, there are only twenty-seven New England communities receiving airline service, and that, for the most part, is oriented to the Boston-New York markets. Intra-New England airline service does not lend itself to the efficient functioning of a certificated airline. Due to the advent of modern highways, coupled with the entrenchment of this surface mode, it appears highly unlikely that certificated airline service will be restored in the foreseeable future to the fourteen New England communities which lost airline service in 1962. In fact, many Boston markets within New England are not efficient when measured against the productive capacity of the equipment being operated. There appears, then, to be a potential as well as a real demand for the development of third level airline operations within the region. In fact, they are already serving many communities within the six-state area. (See Exhibit IV-2, page 187.)

Initially, such an operation had only a marginal chance of success, due largely to the lack of proper equipment to serve markets of short stage lengths and low traffic densities. However, in the last few years the aircraft manufacturers have realized the potential that exists for third level airlines and have begun to offer aircraft that display all the characteristics necessary for a successful operation. These new aircraft are, in essence, miniature airliners, a vital necessity in gaining public acceptance. They have reasonably high seating capacities (up to twenty) coupled with relatively low operating costs. The combination of suitable aircraft, more sophisticated management techniques, and sound governmental policies should allow the third level airlines to become viable economic entities with much to contribute, not only to this region's transportation needs, but to the

transportation system of the nation as a whole.

What, then, need be done to ensure that these third level carriers grow in New England? Potential third level markets exist throughout the region, as well as the rest of the United States. However, to the community which has lost service, or to another which by expansion and growth vitally needs service today, it may well not be enough to say that this type of operation is growing and is on the way. The City and Town Council, the Chamber of Commerce and the local people may want it now, not just as a promise of future action. The question to be answered is, "What can government do to speed up this process?" One method that has been suggested is the creation, through regulatory procedures, of a certificated third level airline system and, if need be, even the subsidization of such an operation. This would, in essence, reconstitute the local service air carrier to fill the void caused by their prior rise on the industry ladder to the status of so-called "regional" carriers. This again may be expedient but there are ramifications that should be considered, as well as alternative courses of action that offer a potentially wiser path for the New England Regional Commission, and, indeed, any government body to follow.

There may be some merit in the certification of such an operation; the most obvious and undoubtedly the true intent of such a procedure would be to afford the operator protection by precluding the unlimited entry of other companies into a market that he has developed. However appealing this may be to the proponents of such a course of action or to the operators who hold such a certificate, it is doubtful that the general public would reap proportional benefits. When a company accepts such security, it also accepts the responsibility to adhere to the demands of the governmental body affording it this protection. Likewise, the governmental body which affords the concession usually feels it necessary to dictate additional conditions as well as assuming responsibility for the carrier's economic well-being in the markets he subsequently decides he does not want after all, or never wanted. If history is to teach anything, the likelihood must be recognized that a certificate to operate in a number of viable markets would carry the condition that some specific unprofitable markets also be served. What would then ensue would be a repetition of history. There would be created a new subsidy demand to support these less attractive markets or the carrier, who also is going to want concentration in the more lucrative markets, would then ask for discretionary relief to suspend service. The net result of any federal subsidization or regulatory intervention would, in the long run, not ensure service to the communities

which are most in need of it. The exit of the third level carrier from these smaller, less productive markets would follow, like the exit of the trunks, the regional and local service carriers in the past.

Although the lack of this component in the transportation system is today a regional problem, the resolution of the problem rests more fittingly with the local communities or the states rather than the New England Regional Commission.

If a state or community feels a compelling need to see the entry of third level carriers, they have at their disposal various methods by which they could, in fact, subsidize such a program. Through a cooperative effort on the part of municipal and state governments, as well as the business community of the local area, an attractive proposal could be assembled that may well make a community, otherwise not considered, a likely candidate for third-level operations. Such an attraction could well be the remittance of all or part of the state tax on aviation fuel, if such a tax exists. The municipal government could provide terminal facilities either rent-free or at a very low rate; the management of the airport could waive landing fees; the established business community could underwrite the costs of leased telephone lines, secretarial help; major industries and/or resorts could guarantee a given number of seats, etc. These are direct subsidies, however, and they would not necessarily go on forever. They could be useful, though, in helping the carrier establish his market, a process which is considered to take from two to four years. Once having done this, the carrier could assume full responsibility for his operation. The major difference between a subsidy of this nature and federal subsidy is that it is being administered by the local government and/or the state in which the service is being provided, and if, at any time, the cost becomes too high it can be discontinued. If these markets are potentially strong, the companies currently engaged in third level operations and those that will eventually enter the scene will seek them out. If, on the other hand, the market is weak or questionable, then it is the responsibility of the individual communities to seek out and make concessions to the operator if they really want this service.

It is an inescapable conclusion, however, that subsidy in any form is going to benefit very few people. The third level operators have demonstrated willingness to go into markets generating eight to ten passengers a day. Subsidy is unnecessary for that level, being "required" only at lower levels. Subsidy, then, is going to expedite the travel of, say, five people a day. The benefit can hardly match the cost for any public body.

The truly beneficial function that can be performed by a body such as the New England Regional Commission in the evolution of this new airline industry is one of a very interested third party to insure that the communities and the states have an opportunity successfully to encourage third level carriers. The development of this third level network should be monitored and evaluated by the Commission. As situations develop that show difficulties or deficiencies the "good offices" of the Commission could be utilized to bring together the carriers and the communities so that a workable arrangement can be made.

As can readily be seen when comparing Maps IV-2b and IV-3 on pp. 189 and 190 and Exhibit IV-4, p. 192, very few of the non-hub communities in the region are linked with each other by air service. Indeed, many of the Boston segments of the scheduled airline routes themselves are not conducive to profitable operations. This, then, is the area having potential for the third level carrier in the regional transportation system. The good offices of the New England Regional Commission can assist the communities and the carriers in getting together in an atmosphere of mutual cooperation to plan and encourage use of service. This, as well as other economic studies undertaken by the Commission, should be made available to prospective carriers to assist them in market evaluations.

I. AIR TAXI - CHARTER - CORPORATE AVIATION

The remaining communities throughout the six-state region that do not have airline service and will not receive third level service would continue to call upon the services of the air taxi and charter operators to provide for their air traffic needs. In order to insure the maximum utilization of this segment of the transportation system and thus lower the cost of such travel, it is suggested that all promotional material originated by either a state or the New England Regional Commission show the current air taxi and charter operators so as to ensure the maximum disclosure that such service is offered in a particular area.

The one remaining segment of general aviation previously unmentioned is that of corporate or business aviation. In the truest sense of the word, this activity does not constitute a public mode of transportation; rather, it is utilized in lieu of the public transportation. The aircraft in use in this sector ranges from a four-engined, turbine-powered aircraft being operated by a large national concern flying in groups of customers or executives, to a single-seat aircraft flown by a local businessman going to a meeting in some other community. The degree of economic dependence an

area may have on an industry or business may result at the local level in a feeling that business flying is as important as airline or third level service. However, there is no network or system involved. Thus there is no regional implication which would warrant this section of the aviation industry receiving similar regional consideration as is given highways, airlines, bus and rail. The determination of the value of corporate or business aviation rests with the local communities and should not be considered to be a part of the regional transportation system by a body such as the New England Regional Commission.

J. AIRWAYS AND AIRPORT SYSTEMS

Thus far the discussion has been confined to the aircraft as a vehicle and its associated role in transportation. However, it cannot function if it does not have an airport from which to operate, or airways along which to fly. The federal airways system in New England and, indeed, throughout the whole country is at the present time adequate to handle the volume of air traffic imposed on it during normal periods of operation. However, continuing efforts must be made to control more efficiently the movement of aircraft during peak periods.† Except for the promotion of ultra-high-speed rail service discussed in Appendix B, there is little that can be done by the New England Regional Commission other than to support the efforts of the Federal Aviation Administration to develop the necessary technology and provide the hardware and manpower to achieve this goal. As specific suggestions for the regional improvement of our airways, the following are offered:

1. The FAA should assume the operation of all non-Federal-owned and operated navigational aids currently in use that define an airway.*

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*That is, which provide en route guidance to aircraft rather than simply providing guidance in landing at a single airport or some other localized function.

†The 1966 FAA appropriation of $866.7 million provided in excess of $600 million for improvements and operation of the airways and air traffic control systems. The same appropriation made $75 million available to the Federal Aid to Airport Program. Thus approximately 11.5 times as much federal money is being spent on the airways and traffic control system as on the airports themselves. To ensure that today's level of efficiency and safety continues in the future, even larger sums will be required.

2. Upgrade all navigational facilities used to define an airway to at least a VORTAC (Very high frequency omnidirectional radio range/tactical air navigation system) capability.

3. Voice radio communication should be made available in the remote areas, particularly in mountain sectors, along the seashore, and areas of sparse population. Such facilities would not only provide for the more efficient control of aircraft, but would aid in rescue and/or search operations in the event of a mishap.

The last remaining area to be discussed relevant to aviation's role in the transportation system in New England is that of the airports themselves. All too often, the airport is provided prior to a determination of what that facility is meant to do. This has led to facilities far in excess of what is actually required in some areas, and glaring deficiencies in others. It can be said in general concerning the airports of New England that there appears to be a sufficient number of airports, but their quality needs much consideration and improvement.

There are, at this writing, 430 airports in the six-state New England region, 129 of which are publicly-owned, with the remaining 301 operating as privately-owned facilities (Exhibit IV-7). If the 129 publicly-owned airports were improved, uniformly equipped and strategically located, this number could more than adequately handle the public transportation demands placed on them. Just as every hamlet and village throughout the area cannot expect to have the interstate highway system pass adjacent to its bounds, neither can every small community expect to have a publicly-owned airport. It is not, however, suggested that the actual number of public or private airports be reduced, but instead that the number being considered as vital for the region's transportation system be held within reasonable bounds. In order that an intelligent judgement be made as to what is in the public's interest, particularly in the area of the general aviation airports, it is strongly urged that the New England Regional Commission undertake a study to develop criteria and procedures that may be used by any interested community to evaluate the cost of and benefits derived from the expenditures required to provide facilities for general aviation. Such a study is necessary in order to identify the areas in which there is definite regional implication, action required, and endorsement if necessary by the New England Regional Commission.

A subject of particular importance should be investigation of the regional implication of corporate or business flying. This is an area in which much sentiment is expressed, either for or against, and one in which very little quantitative analysis and study has ever been done. If spending of public

Exhibit IV-7
Selected Airport Data

	Total Airports	Public	Private	Paved	Lighted	Paved & Lighted	Airports Included In NAP 1966/67
Conn.	85	12	73	37	17	15	22
Maine	137	45	92	27	20	19	59
Mass.	118	30	88	43	35	26	40
N.H.	41	14	27	14	9	9	22
R.I.	11	5	6	6	5	4	5
Vt.	38	13	25	9	8	6	18
Total N.E.	430	129	301	136	94	79	166
Total U.S.	9,566	3,570	5,996	2,747	2,878	1,977	3,877
% U.S.	4.5	3.6	5.0	4.9	3.3	4.0	4.3
N.E. %		30.0	70.0	31.6	21.9	18.4	38.6
U.S. %		37.3	62.7	28.7	30.1	20.7	40.5

SOURCE:

Census of U.S. Civil Aircraft as of December 31, 1965
National Airport Plan 1966-1967

monies is to be endorsed on a regional basis, then the regional ramifications of such actions must be known in order to produce a wise assignment of these funds.

The 129 publicly-owned airports within New England are, for the most part, administered by the various municipal and state governments. Funds for the development and improvement of these facilities are provided by the local communities and state governments, matched with federal funds from the Federal Aid to Airport Program administered by the FAA. One only has to look at a map of the New England area (Map IV-4) to see that there has been very little coordination and liaison between the various states. The National Airport Plan itself, as approved by the FAA, even more graphically shows that there is a definite function to be fulfilled by bodies such as the New England Regional Commission and that it is one of coordination to ensure that the public monies spent on airports are not duplicating present facilities, as has been the case in a number of instances such as those mentioned below. The current National Airport Plan, covering fiscal years 1968 to 1972, includes not 129 public airports within New England but 166. Aviation is a rapidly growing and expanding sector of the economy, and it is this very growth and expansion that will not allow an indulgence in the helter-skelter spending of money for new airports without a complete regional master plan.

The 166 airports included in the current National Airport Plan call for program expenditures of $191,406,000 in the next five years. This may, or may not, be adequate to ensure the proper facilities to accommodate the region's growth; but one cannot avoid questioning the wisdom of having three publicly-owned airports included in the National Airport Plan straddling two state boundaries with a total lateral distance of fifteen nautical miles between them.* Nor can a body such as the New England Regional Commission bless, out of hand, the inclusion of seven National Airport Plan airports within a thirty-two-mile radius of two isolated smaller communities.† These are just two examples - there are many others. However, this question does point to the clear and definite need for a Regional Airport Plan; one that will assign roles and tasks to be fulfilled at the various airports, as well as calling attention to the needed improvements and set a time schedule

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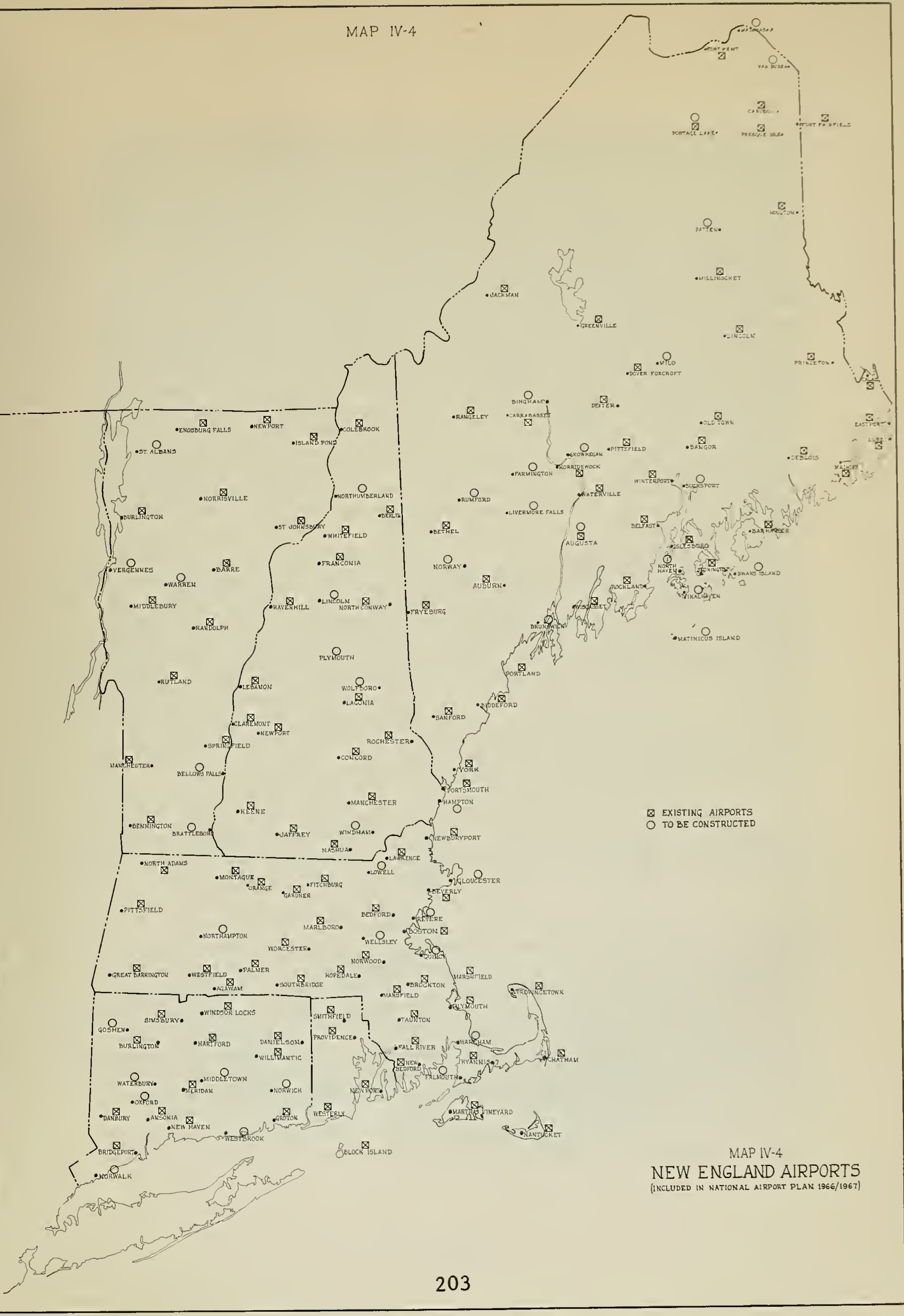
*Newport, New Hampshire; Claremont, New Hampshire; and Springfield, Vermont

†Caribou-Presque Isle, Maine



MAP IV-4

NEW ENGLAND AIRPORTS

(INCLUDED IN NATIONAL AIRPORT PLAN 1966/1967)

for their implementation.* Certain programs and improvements at the region's airports must be included in the National Airport Plan. The monetary expenditure would be too great for any single community or state to undertake. However, at smaller airports, there is definite merit in excluding them from the National Airport Plan, since improvements and upgrading of these facilities can be handled more efficiently at the state and local level. Each of the various states has experienced in one way or another the financial limitations caused by over-construction done in adherence to FAA standards. The states also have experienced the relative ease and total satisfaction of having undertaken state and local projects to meet these smaller airport needs. There should not be a reduction in total numbers of publicly-owned airports, for no community having received the benefits of such facilities would willingly give them up; however, what is needed is a more definitive classification and breakdown of these public airports. Some publicly-owned airports presently included should be eliminated from the National Airport Plan. Those airports not included would then receive only state aid for improvement projects, thus releasing much of the $119,406,000 for improvement funding at the Regional Airports. By the creation of a Regional Airport System, truly regional airports would be established. Action of this nature would allow public monies to be concentrated in those areas where the greatest possible good would be accomplished. Concurrently, the New England Regional Commission, through the various state and congressional delegations, should introduce legislation to improve the scope of the Federal Aid to Airport Program and funding for those airports designated as New England Regional Airports.

The present statute contains numerous built-in limitations and many needed facilities are excluded from improvements funded by this Program. It is not enough to provide the necessary runways, approaches and other aeronauti-

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*Such an approach is not in itself new. The New England Council conducted studies of this nature in 1960-1962 ("A Master Plan for Regional Airports to Serve Scheduled Air Transportation Needs in New England") resulting in the CAB hearing known as the "New England Regional Airport Investigation." Unfortunately, what came about was the phrase "Regional Airport" with little or no coordination to implement the actions envisioned by the New England Council.

cal needs if the people who are going to use these facilities are not similarly considered. Therefore, it is suggested that the statute might be broadened. At the same time, the Commission should study a uniform, area-wide users' charge or other revenue raising means to provide the necessary terminals, parking lots and other essential but non-aeronautical facilities at the airport complex. The forms such a system might take are varied. To begin with, a uniform system of landing fees should be considered throughout the six-state region. The New England Regional Commission should sponsor a conference of the six states to establish a uniform aviation gasoline tax to be levied against aeronautical users. Turbine-powered aircraft are no longer a novelty, they are an every day fact of life, and it does not seem realistic that turbine fuel should go untaxed when there is a need for revenue to provide the necessary facilities to permit these aircraft to use many existing airports. Other sources of revenue might be considered as well as the possibility of relating the charges to cost.

A corollary benefit from such an undertaking would be the status it would lend to the airports included within the Regional System. A rapid upgrading of these facilities would result. The Federal Aviation Administration should be asked to install all the required electronic and air traffic control facilities fully to utilize the capability of these airports.

The planning necessary for the implementation of such a program would, in itself, be quite exhaustive and detailed. Therefore, it is recommended that initial steps be undertaken soon. Aside from the determination of where the Regional Airports should be, a priority system for their improvement and a set standard of goals to be achieved should be included. To ensure the maximum degree of operational capability of these airports, it is recommended that uniform criteria, by airport class, be established throughout the six-state New England region. Airports to be included in the list of New England Regional Airports, aside from runway requirements, should have as minimum facilities parallel taxi-way, high-intensity approach lights and electronic landing aids allowing approaches to irreduceable minima depending upon surrounding terrain, as well as adequate passenger facilities. Detailed investigation of the local weather phenomena throughout the New England region should be an integral part of such a study. Many airports are located in hilly areas, and areas that offer little or no low-cost expansion potential. After fully evaluating assessments of future growth trends in these particular areas and future transportation needs, if it becomes clear

that these sites are, in fact, developed to their ultimate capability, then alternate sites must be selected if aviation facilities for the locale are to be provided. It is to be hoped that the present facilities will usefully serve these areas for many years through the use of available STOL aircraft. If this is not the case, the alternate site should be selected and protected either through outright purchase or restrictive covenants on land use so as to insure its availability for future development as an airport. Such action could conceivably have the result that a particular locale within the New England region now receiving airline service had to face the day when the local airport could no longer be used and the realization that travelers will lose local airline service by the relocation to another site. This may seem drastic and unacceptable at the present time, but in the long run it would be far better to have adequately equipped airports that will permit all-weather airline operation at a more remote site than to continue at the present low operating factor prevalent in many of the areas, especially the mountainous areas of the New England region. Coordination with the highway planners is desirable to insure that the regional airports are well-served by the interstate system and access to the major centers is rapid.

K. THE FUTURE OF AVIATION IN THE NEW ENGLAND TRANSPORTATION PICTURE

Thus far the discussion has been centered on the functional considerations of aviation and how these lend themselves to contribute to the region's total transportation network. In order to keep the overall picture in focus, much statistical data has been omitted from this discussion. However, in assessing the future contribution aviation is to make we must look at historical trends in utilization, equipment and activity if these forecasts are to be meaningful. Data of this nature is well documented by the FAA and CAB, as well as independent studies. These common sources of material will be used when at all possible.

It seems clear that the future contribution aviation will make in the regional transportation system will be determined in large part by the actions of bodies such as the New England Regional Commission and the various states. Its potential can be discussed, its shortcomings discovered, and areas requiring remedial action identified, but none of the potential will be realized unless governmental agencies, as planners and implementers, provide the facilities to meet the challenges of the next twenty years.

Predicting the future is always a perilous task. Such prediction is especially hazardous when dealing with a subject such as aviation where so much depends on many socio-economic variables. It is not believed that the aircraft will become a commonplace vehicle such as the automobile as some thought after World War II. It is now and will continue to be too expensive for the average citizen to own and operate an aircraft. In 1938 no one could visualize the aviation activity which had taken place by 1955, nor could the 1965 impact of aviation be foreseen in 1948.

The vehicles themselves will change; utilization of them will change. The functional contribution of the airlines in the future will conform to the long-haul role they best can serve. The nature of vehicles to be operated dictates this. With the advent of the so-called jumbo jets and eventual entry of the supersonic transport, it will be even more unrealistic to expect airlines to serve in other than high-density, long-haul markets. According to studies compiled by the FAA, a growth in airline traffic can be anticipated that will continue to outpace the nation's population as well as the economy. Exhibit IV-8 summarizes this anticipated increase in airline usage. The FAA forecast terminated with the year 1975; to arrive at the 1985 forecast, an annual increase of 10% is used. The allocation of the total volume of enplaned passengers to New England was accomplished by examining the historic ratio of New England-originating passengers to the total U.S. during the period 1960 through 1966. Since the ratio ranged from 4.29% in 1963 to 4.01% in 1966, 4% was used in these forecasts to project enplaned airline passengers at New England airports. In order to plan facilities for the convenience and efficient handling of these people the total volume of air passengers utilizing the airport must be known. The ratio of O&D to enplaned and deplaned passengers in New England shows that for every eighty-three O&D passengers there are 100 passengers enplaned and deplaned. Thus adjusting the enplaned passengers forecast for 1985 produces not double the 29,300,000 shown, but rather 53,619,000 passengers arriving and departing New England airports. Subtracting from this the intra-New England passengers leaves 50,900,000 airline passengers arriving and departing New England from and to various other sections of the United States. The removal of these intra-New England passengers from the O&D total is valid for two reasons: First, as stated earlier, this type of service is not consistent with most of today's trunk airline operation, and will be less consistent with the equipment in use by the year 1985. These passengers represent the existing carriers' intra-New England market. It must be borne in mind

Exhibit IV-8

Enplaned Airline Passengers (000)

Year	United States	New England
1960	50,584	2,054
1966	102,200	4,103
1967 (projected)	114,800	4,592
1968 "	127,400	5,096
1970 "	150,800	6,032
1975 "	258,000	10,320
1980 "	434,800	17,392
1985 "	732,600	29,300

SOURCE:

Airport Activity Statistics 12 Months Ending December 31
National Airport Plan FY 1968 - 1972

that this is a market that has not yet been adequately served. Expanding the 1966 intra-New England O&D at the same rate as the total O&D would produce 2,719,000 intra-regional travelers by 1985, but the actual number could well be higher due to the stimulating effect of expanding third level service. Exhibit IV-9 lists the third level airlines within New England at the present time.

Thus far, the emergence of third level airlines in the U.S. and in New England has seen a consistent type of route structure established. This has generally been a spoke-type operation emanating from the large metropolitan areas to the more important outlying communities. Undoubtedly this practice will continue. Recently, however, various trunk and regional airlines have entered into contractual agreements with third level operators whereby the less popular and less utilized certificated routes are turned over to the third level operator.

Considering the passenger volume on certain routes within New England and the equipment being used by the scheduled airlines, it is strongly urged that specific segments of the trunk system within New England be turned over to responsible third level operators. Such a takeover of existing routes coupled with the development of other markets oriented towards the large metropolitan areas will constitute the initial third level route structure with New England. Additional routes could be established so as to create an intra-New England airline system. Comparing Exhibit IV-4 with Exhibit IV-5 (pages 192-193) shows the vivid contrast of the number of New England communities that did exchange passengers in 1966 to the number of city pairs that had single-plane service. Thus there appears to exist a potential intra-regional route structure pairing many of these communities as well as those already joined by the trunk system. Exhibit IV-10 lists a computed 1966 potential traffic derived by regression analysis. This figure is the result of applying the same traffic-to-population ratio actually produced in the city pairs which were served. This is not to say that someone should immediately go out and try to provide third level airline service; however, it does indicate that there appear to be numerous city pairs within New England for which complete market studies should be conducted in order to evaluate this potential, that is, to discover the markets where true community of interest does exist. Since traffic is invariably stimulated through the provision of through plane service (not present in many of the pairs forming the data base) the potential is doubtless substantial. This appears to be sufficient justification for the New England Regional Commission's active en-

Exhibit IV-9

NEW ENGLAND'S THIRD LEVEL AIRLINES
AND EQUIPMENT IN USE - 1968

Airline	Equipment
Air General	4 Bell 206 4 Bell 47
Cape & Island	4 Beechcraft D-18 1 Pipe Navajo 1 Piper Aztec 1 Piper Cherokee 6
Down East	1 Piper Navajo 1 Piper Aztec
Executive	3 DeHavilland Twin Otter 3 Beechcraft QueenAir 3 Aero Commander 500B 1 Piper Cherokee 6
Newport Aero	2 Aero Commander 500B 1 Aero Commander 600T 1 Aero Commander 630FL
Northern	1 Beechcraft D-18 3 Piper Aztec 1 Beechcraft QueenAir 1 DeHavilland Twin Otter 2 Piper Cherokee 6 2 Beechcraft Westwind
Pilgrim	3 DeHavilland Twin Otter
Provincetown-Boston	3 Piper Cherokee 6 1 Douglas DC-3 2 Lockheed 10A 1 Lockheed 10E 1 Cessna VC-78 2 Piper Apache
Trans East	3 DeHavilland Twin Otter
Vermont International	1 Beechcraft D-18
Viking	3 Piper Aztec 2 Piper Cherokee 6 2 Islanders
Yankee	2 DeHavilland Dove

TOTAL: 67 Aircraft

SOURCE: Systems Analysis and Research Corporation
Telephone survey - May, 1968

Exhibit IV-10

New England City Pairs
Population Product* Greater than 50,000,000
(excluding Boston and city pairs
with inter-city mileage of less
than 50 miles)

City Pairs	1966 O&D	1966 Computed Potential O&D
Augusta-Bridgeport	90	300
Hartford	160	430
New Haven	10	330
Providence	40	300
Bangor-Bridgeport	90	1,170
Hartford	1,060	1,350
New Haven	20	860
Providence	150	1,140
Worcester	-	650
Bridgeport-Burlington	10	150
Lewiston	10	300
Manchester	-	4,730†
New Bedford	-	7,890†
Presque Isle	70	680
Portland	180	2,760
Providence	-	15,350**
Worcester	-	12,430**
Burlington-Hartford	520	700††
New Haven	-	110
Providence	300	330
Hartford-Hyannis	70	90††
Lewiston	30	430
Manchester	20	3,250†
New Bedford	-	8,450†
Presque Isle	770	830
Portland	800	3,040†**
Providence	2,630	16,370**
Lewiston-New Haven	-	330†
Providence	20	300†
Manchester-New Bedford	-	860†
New Haven	-	2,970†
Providence	-	2,910†**
New Bedford-New Haven	-	7,920†
New London	-	1,020†
Portland	20	770†**
Worcester	-	6,150†**
New Haven-Presque Isle	10	700†
Portland	80	2,790†
Providence	20	15,410†**
Worcester	-	12,490†**

City Pairs	1966 O&D	1966 Computed Potential O&D
New London-Worcester	-	2,320†**
Presque Isle-Providence	10	670†
Worcester	-	240†
Portland-Providence	130	2,740†**
Worcester	40	1,950†**
Total 1966 O&D	7,360	
Total 1966 Computed Potential O&D		146,660

*The product of the populations of the two cities of the pair

†Probably high due to lack of community of interest

**Probably high due to direct super highway connection

††Probably low due to high potential community of interest

SOURCE: Civil Aeronautics Board, Domestic Origin-Destination of Airline Passenger Traffic, 1966. Potential O&D computed by Systems Analysis and Research Corporation as explained in text.

couragement of the development of such a third level airline system.

From the foregoing discussion it can be seen that the demands placed on the airports and airways of New England by only the public transportation sector of the aviation industry in themselves will saturate some of today's existing public facilities. Since the airways system and the airports must serve all components of the aviation industry, due consideration must also be given to the anticipated growth of general aviation. The only common source of reference material published dealing with the numbers of general aviation aircraft in the U.S. is the annual FAA census of aircraft. Since there exists no common system of aircraft registrations within New England, it was necessary to use FAA figures. If a state's figures differ from the FAA census, an appropriate correction factor can be applied to the New England future aircraft populations. The actual number of aircraft to be found in New England is not so important as the activity that will result in the capacity required for the airport and airways system. Examination of the ten-year period 1956 through 1966 shows that 3.12% of the active civil aircraft in the U.S. were owned by residents of the six New England states. During the latter years of this ten-year period there has been a leveling off at approximately 3%. The New England percentage of U.S. general aviation aircraft was held to 3% in allocating the FAA forecasts to the New England states. Exhibit IV-11 indicates that there will be an approximate threefold increase in the numbers of aircraft owned by New England residents between 1965 and 1985, or approximately 8,100 general aviation aircraft.

The absolute numbers of aircraft in airline service will increase during the period of the forecast through 1985 at a rate much less than that of the general aviation sector. However, the increased productivity of the vehicles in use will allow the anticipated eightfold increase in the number of airline passengers. Needless to say, the present airways systems will not be adequate to handle this volume of aircraft, but steps are being taken by the FAA to evaluate and develop automated systems for control. There is little that can be done by a body such as the New England Regional Commission aside from supporting such efforts of the FAA to develop the necessary technology and hardware for the system. The provision of necessary ground facilities, on the other hand, does fall upon the states and the New England Regional Commission. Preliminary design specifications and forecasts of operational data for the first jumbo jets and supersonic transports indicate that even larger airports

Exhibit IV-11

General Aviation Aircraft in U.S. - New England

Year	Total U.S. (000)	New England-Based
1960	76.5	2,400
1965	97.5	2,954
1970	136.0	4,080
1975	173.0	5,190
1980	216.5	6,495
1985	270.6	8,120

SOURCE:

Census U.S. Civil Aircraft 1965

FAA, A Study and Forecast of the Fleet and its Use in the U.S. in 1975

will require some work to be able to operate these new aircraft. The efforts to increase operational reliability and the certification of airports for lower instrument minimums (CAT II and III) will require longer runways. Most of New England's existing runways will have to be lengthened and strengthened. This problem must be solved by government, with the cooperation of the aircraft industry and airlines. Restraint must be exercised in design criteria as well as equipment selection in order to preclude an unending spiral of ever-longer runway lengths. Awareness of this responsibility is believed to exist and the largest vehicles will in all probability be operated from approximately ten to twelve thousand foot runways for the foreseeable future. The real dilemma, however, facing the region's airports is not to meet the aeronautical aspects and requirements but rather to meet the anticipated passenger and cargo terminal needs. Existing travel patterns must be altered, new routes awarded as markets can support them and diversion of flights from the congested metropolitan areas must take place to avoid serious congestion. If today's travel patterns are not altered, Logan Airport in Boston or any other future airport designed primarily to serve Boston would be called upon to process in excess of forty million passengers per year by 1985. This would place on a single airport the requirement of handling approximately three times the volume of passenger travel handled at the three metropolitan airports in New York in 1966, a patent impossibility using present thinking and techniques.

The aviation industry and those concerned with aviation in government cannot and should not be called upon to solve these problems alone. There clearly exists a need for complete intermodal integration of thoughts and resources to provide adequate facilities for the efficient movement of this number of people. Saturation of capacity, although threatening in some of the airfields within the six-state area, manifests itself most dramatically in the most densely populated areas, the most dramatic example being Boston's Logan International Airport. Although few communities the size of Boston have an airport as close to the downtown business area, relief must be provided if this facility is to continue to function. With the largest concentration of people in New England being in the areas of Boston, Providence and Hartford, coupled with the severe congestion in New York, a suggestion worthy of serious consideration is the construction of a major jet facility somewhere in southern New England so situated that it could serve in conjunction with other modes of travel to the densely populated areas mentioned above. With the probable establishment of

high-speed rail service between Boston and New York, a new jetport near its midpoint offers an attractive site.

Such a facility, so situated, coupled with high-speed ground transportation to the major urban population areas, would be a distinct advantage over the present pattern of air service. Logan and the airports in Hartford and Providence can still continue to function and airline service would still be provided; however, for long-range domestic as well as international service the new facility as outlined should be utilized. An airport such as this, coupled with the other envisioned regional airports utilizing long-range trunk service augmented by reliable third level intra-regional service, could adequately fulfill the demands of the traveling public.

L. INDUSTRIAL AIRPARKS

Because the matter of industrial development is a concern of the various local communities throughout the six-state region it is necessary to raise a note of caution concerning a relatively new innovation known as the industrial airpark. Airports do require a vast amount of land in relation to the actual area used for runways, taxiways, terminals and other facilities. In addition, industry quite often seeks location near airports for convenience in transporting executives, companv personnel and freight. Local government seeks the opportunity, by combining these two facts to convert non-tax-producing land into a source of tax revenue and employment. However, a desire to broaden the tax base must be tempered with wise judgement relevant to all other aspects of the community. The possibility that sufficient land is present to accomplish this objective exists in many of the region's smaller communities. This use of what appears to be excess land, however, could in the absence of serious deliberation and careful planning hasten the day when the facility can no longer function as an airport. If this is allowed to happen, the community faces not only the loss of an aeronautical facility but also the industry itself.

Chapter V

New England's Seaports and Water Transportation

A. SUMMARY

New England's ports played a dominant role in the early industrial development of the area. Greater reliance upon land transportation has decreased the relative importance of the ports but their contribution to New England's economy continues to have significance. New England's industry annually exports manufactured goods valued over $1.3 billion (4.4% of its production) and the ports annually represent revenue of some $0.2 billion.

New England's ports have sufficient overcapacity to handle projected tonnage growth for many years, although unused facilities are in seriously deteriorated condition. Two technological developments in waterborne commerce, increased vessel size and containerization, could have a significant impact on the ports.

The use of jumbo tankers in petroleum service is rapidly increasing. These ships have a draft requirement exceeding 70 feet. The 70 foot draft requirement is not currently available at any of New England's ports. The price of petroleum products could be affected if facilities are not available to handle jumbo tankers. Thus, answers should be found for the following questions:

1. To what extent would jumbo tankers be used to serve New England if facilities were available?

2. What will be the impact on New England's economy if the use of jumbo tankers is feasible?

3. If off-shore terminals are required, where should they be located?

4. To what extent will public funds be required to provide adequate terminals?

Containerization greatly reduces distribution costs for shippers and handling costs for steamship operators. Containerization efficiencies plus improvements in documentation requirements, publication of door-to-door rates, relaxed trade barriers and improved communications may well result in an unprecedented growth in world trade.

The economies of scale of containerships are such that to achieve maximum efficiency traffic must be centralized at a few loading ports. Boston's ability to attract container service is hindered by its proximity to New York.

Boston must compete with New York's greater frequency of service and the ease with which containers can be moved overland from the New England area to the New York port.

The rush to containerization will result in overcapacity and stiff competition among steamship operators. This period of overcapacity and strenuous competition should last for a minimum of five years. During this period the need to fill containerships will result in operators' stopping at more ports than economics would otherwise dictate. It will be during this period that Boston has the best opportunity of attracting containership service. As demand approaches supply and as competition is reduced, operators will be in a stronger position to restrict ports of call. Boston's ability to attract containership service depends upon volume of tonnage, handling costs, and availability of handling facilities. Even a cursory review of the factors involved indicates that sufficient tonnage is available to support limited containership service and that tonnage would be more than sufficient if a good portion of tonnage originating in New England now moving through the port of New York could be diverted to Boston.

Thus, attention should be directed to determining the need of additional container handling facilities at the Port of Boston. If additional facilities represent overcapacity and will be unprofitable from a revenue standpoint, the question then centers around the economic impact upon the area if the service is not available. It may be better to face some overcapacity than to make a decision that may deprive New England's industry of the chance to compete in the world market.

Boston's port labor problems affect the entire New England area. Because of the resulting restriction of service, tonnage is diverted to New York thus increasing industries' cost and losing port-generated revenue. If unduly restrictive labor practices are imposed for handling containers, the Port of Boston will not be able to become competitive with other Atlantic ports and its ability to attract containership service will be severely hampered.

B. INTRODUCTION

Its abundance of seaports was an important factor in New England's development as an important industrial center. Until well into the nineteenth century, boats provided the only efficient transportation service available. As efficient land transportation developed, dependence on water service became decreasingly important. Today, although

industry does not rely on the ports as heavily as it did in the past, the ports nevertheless contribute significantly to the economy of New England. In 1966 New England's industry exported manufactured goods valued at $1.3 billion, or 4.4% of total manufacturing of $29.9 billion.* In addition to providing New England industry with nearby shipping service, the region's ports contribute in other ways. Factors of community income directly represented by services to vessels and by port operations are listed in Exhibit V-1. Various studies** have estimated that a ton of general cargo represents $15 to $20 of revenue to the local economy and a ton of bulk commodities about $2.50. Using revenue figures of $17.50 per ton of general cargo and $2.50 per ton for bulk, Exhibit V-2 shows revenue thus represented at New England's nine major ports based on 1965 tonnage amounting to $0.2 billion. Exhibit V-3 lists the nine major New England ports based on tonnage handled and briefly outlines available facilities. Exhibit V-4 shows the major commodities handled at each of the larger ports. Exhibit V-5 shows tonnage handled through Boston and other Atlantic ports. Exhibit V-6 shows tonnage trends among the major Atlantic ports.

New England's ports do not appear to have any difficulty handling current tonnage and sufficient overcapacity exists to handle projected growth for many years. Therefore, this report will focus on two technological changes, increase in vessel size and the impact of containerization, to determine what effect they will have on New England's ports. As can be seen from Exhibit V-4, Boston is New England's largest general cargo port. Thus when considering general cargo problems, this study will be limited to the Port of Boston.

The St. Lawrence Seaway deserves some mention in regard to its impact on tonnage handled through the Port of Boston. The Seaway's principal attraction is to industry located on the Great Lakes and the immediate surrounding area. Direct deepwater service diverts tonnage from North Atlantic and Gulf ports to the Seaway, but the greatest diversion occurs in certain bulk cargos such as iron ore and grain.*** Some general cargo is diverted and it has been estimated that 8% of the Port of New York's general export cargo tonnage originating in the Great Lakes area and 3% of general cargo

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* U.S. Department of Commerce, State Export Origin Series 1967.

** Rowland and MacNeal, Port of Boston, Water-Borne Commerce Market and Development Requirements, New York, 1964. cf. also sources of Exhibit V-1

*** Benjamin Chinitz, Freight and the Metropolis, Harvard University Press, 1960, p. 65.

Exhibit V-1

Factors of Community Income Represented by Services to Vessels and by Port Operations

I. <u>Vessel Disbursements while in Port</u>

(Marine Services)
1. Tug hire
2. Line running
3. Dockage

(Federal Services)
4. Immigration service
5. Entrance and clearance fees
6. Customs overtime

(Labor)
7. Stevedoring
8. Clerking, checking, watchman
9. Cleaning, fitting, equipment renting

(Repair Service)
10. Repairs
11. Structural alterations
12. Special cargo fitting

(Supplies and Chandlery)
13. Foodstuffs
14. Hardware
15. Lubricants
16. Laundry and cleaning
17. Cordage
18. Medical
19. Miscellaneous

(Fuel)
20. Bunker fuel
21. Water
22. Miscellaneous services

II. <u>Port and Terminal Income</u>

23. Cargo stevedoring
24. Heavy-life crane service
25. Car loading and unloading
26. Handling
27. Storage
28. Demurrage
29. Top wharfage

III. Inland Transport

30. Local cartage
31. Local switching
32. Line haul--truck
33. Line haul--rail

IV. Vessel Crew Expenditures

34. Personal items--drugs and sundries
35. Haberdashery and clothing
36. Transportation
37. Tavern, restaurant, entertainment
38. Gift shopping
39. Other

V. Port Services

40. Steamship agency services
41. Customers' brokerage
42. Freight forwarding
43. Warehousing
44. Marine insurance
45. Banking
46. Commodity brokerage
47. Marine surveys
48. International trade consultation
49. Advertising and promotion
50. Communications (telephone and telegraph)

Source: Board of Harbor Commissioners, City of Milwaukee, Impact of the Milwaukee Public Port Development on the Community Economy, A Report to Hon. Henry W. Maier, Mayor (Milwaukee, 1962), p. 12. Reproduced in Eric Schenker, Economic Impact of a Port on an Urban Community, Transportation Research Forum - Sixth Annual Meeting, Oxford, Indiana, 1965.

Exhibit V-2

Revenue Represented at Selected New England Ports
(1965 Tonnage)

Port	Economic Impact ($000) Bulk	General Cargo	Total
Searsport	$ 3,355	$ 1,330	$ 4,685
Portland	45,720	3,062	48,782
Portsmouth	4,135	18	4,153
Boston	47,045	18,148	65,193
Fall River	8,862	2,048	10,910
Providence	21,905	5,968	27,873
New London	2,232	1,418	3,650
New Haven	22,765	11,638	34,403
Bridgeport	6,035	788	6,823
Total	$162,054	$44,418	$206,472

Note: It must be borne in mind that these estimates were derived through the use of Boston averages per ton. Therefore, there may be significant differences from these figures due to the cargo types handled at each port, local labor conditions, work regulations, facilities, etc.

Sources: United States Army Corps of Engineers, Waterborne Commerce of the United States, 1965; Revenue per ton data from Rowland and MacNeal, op. cit., and Board of Harbor Commissioners, City of Milwaukee, op. cit.

Exhibit V-3

Volume Handled and Facilities Available at Major New England Ports

	Short Tons (000) 1965			No. of General Cargo Facilities	No. of Railroads Serving	Warehouse Space (sq.ft.)	Depth (feet)	Open Storage Space (acres)	Cooler and Freezer Space (cu.ft.)
	Total	Bulk	General Cargo						
Searsport	1,418	1,342	76	1	1	36,400	33	-	-
Portland	18,463	18,288	175	4	3	195,500	36	18.0	4,563,390
Portsmouth	1,655	1,654	1	1	1	-	35	15.3	
Boston	19,855	18,818	1,037	33	3	3,500,000	35	-	8,200,000
Fall River	3,662	3,545	117	1	1	85,340	35	3.4	
Providence	9,103	8,762	341*	2	1	120,000	36	60.0	1,614,808
New London	974	893	81	1	2	156,440	33	5.0	
New Haven	9,771	9,106	665**	2	1	142,300	35	15.7	352,728
Bridgeport	2,459	2,414	45	0	1	172,150	35	-	147,520

* About half lumber, oils and greases (see Exhibit V-4).
**Over two-thirds in commodities listed in Exhibit V-4.

Source: U. S. Army Corps of Engineers, Waterborne Commerce of the United States, 1965, Ports of Southern New England, 1964, The Ports of Portland and Searsport, Maine, and Port of Portsmouth, New Hampshire.

Exhibit V-4

Cargo Distribution at Major New England Ports for 1965
(Short tons)

Commodity Class	Searsport	Portland	Portsmouth	Boston	Fall River	Providence	New London	New Haven	Bridgeport
Total	1,417,521	18,462,915	1,654,508	19,854,685	3,661,963	9,102,548	974,188	9,770,680	2,458,938
General Cargo	75,790	175,065	26	1,036,759	116,991	340,106*	81,646	664,633**	45,429
Bulk	1,341,731	18,287,850	1,654,482	18,817,926	3,544,972	8,762,442	892,542	9,106,047	2,413,514
Major Bulk Commodities									
Petroleum	1,175,326	18,173,015 1/	1,407,079	16,143,329	1,975,255	8,018,488	813,125	8,272,049	2,219,379
Coal	51,720	37,693	101,470	591,944	1,568,981	347,139	-	487,909	-
Grain	-	38,463	-	110,089	-	-	-	-	-
Ore	73,456	38,529	-	42,078	-	9,977	-	570	39,379
Sugar	-	-	-	502,652	-	-	-	-	-
Scrap Iron	-	-	-	372,175	-	122,258	-	164,890	58,272
Cement	-	-	-	112,683	-	170,612	-	51,912	88,771

1/Approximately 83% of this is piped to Quebec.

*Major items are (short tons):

Lumber	83,679
Lubricating Oils & Greases	82,857
	166,536

**Major items are (short tons):

Lumber	75,670
Alcohols	60,992
Basic Chemicals	148,395
Asphalt, Tar & Pitch	115,912
Iron & Steel Shapes	88,428
	489,397

SOURCE: United States Army Corps of Engineers, Waterborne Commerce of the United States, 1965

Exhibit V-4

Exhibit V-5

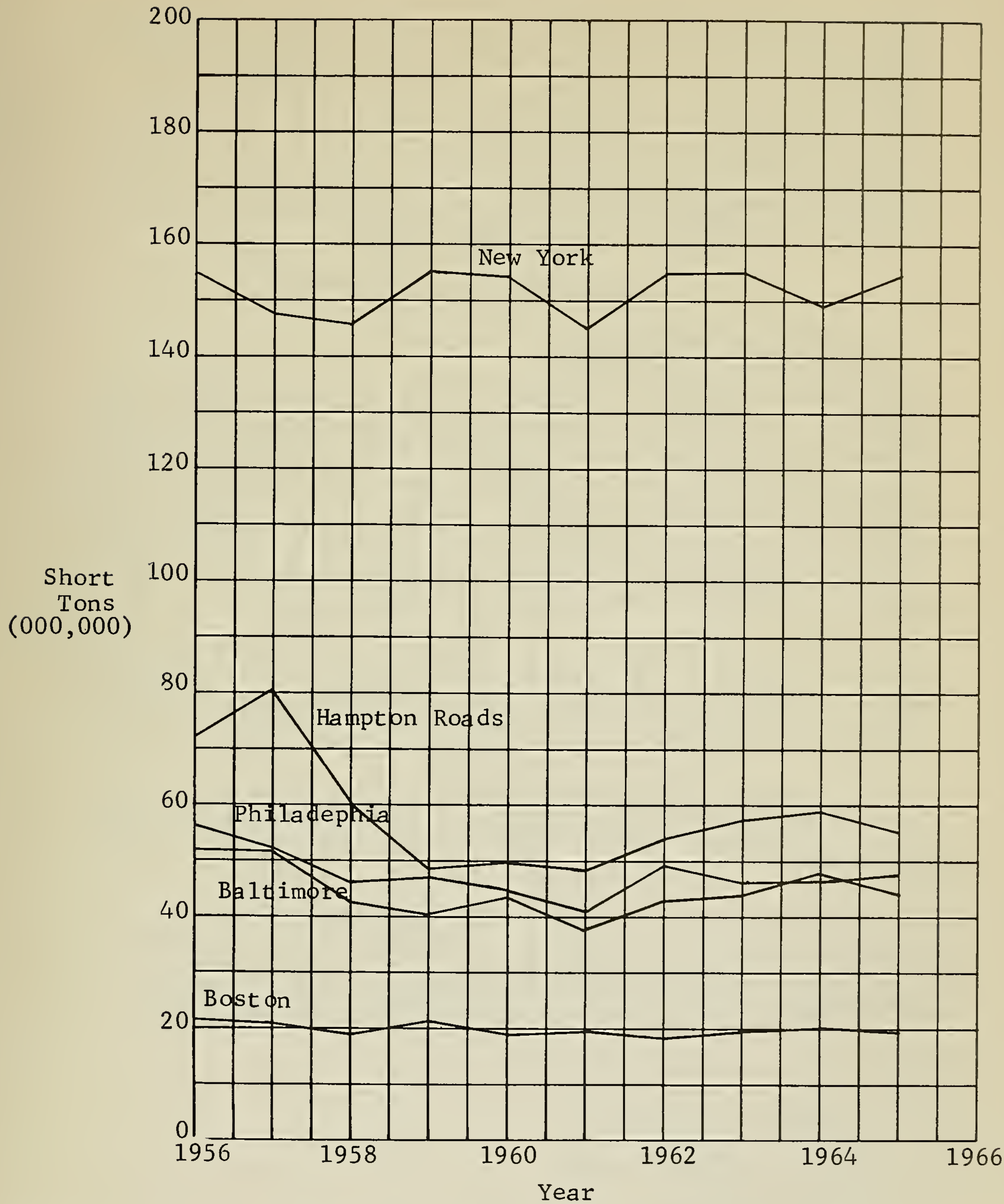
Total, Bulk, and General Cargo at Major Atlantic Ports
Short Tons (000)

	BOS			NYC			PHL			BAL			Hampton Roads		
	Total	Bulk	GC	Total	Bulk	GC	Total	Bulk	GC	Total	Bulk	GC	Total	Bulk	GC
1956	20,978	19,742	1,236	154,708	135,529	19,179	55,713	53,965	1,748	51,580	48,970	2,610	71,698	67,717	3,981
1957	20,326	19,146	1,180	147,537	130,505	17,032	52,127	50,700	1,427	52,014	49,703	2,311	80,464	78,631	1,833
1958	19,275	18,306	969	145,531	128,231	17,300	46,664	45,073	1,591	41,703	39,085	2,618	59,495	58,052	1,443
1959	20,465	19,403	1,062	154,156	137,263	16,893	47,658	46,013	1,645	40,224	37,714	2,510	48,818	47,297	1,521
1960	19,020	18,116	904	153,199	136,039	17,160	44,475	42,921	1,554	43,420	40,993	2,427	49,956	48,344	1,612
1961	19,506	18,276	1,230	144,765	127,902	16,863	40,965	39,195	1,770	37,815	33,928	3,887	48,694	47,249	1,445
1962	18,984	17,821	1,163	154,476	135,947	18,529	49,124	47,106	2,018	42,588	40,021	2,567	53,472	51,752	1,720
1963	19,792	18,627	1,165	154,773	138,832	15,941	46,673	44,853	1,820	43,197	40,750	2,447	57,795	56,115	1,680
1964	20,011	18,981	1,030	149,151	133,603	15,548	47,042	45,582	1,460	48,220	45,982	2,238	59,034	57,742	1,292
1965	19,855	18,818	1,037	153,830	137,152	16,678	47,753	45,805	1,930	44,267	41,111	3,156	54,106	52,128	1,978

Source: United States Army Corps of Engineers, Waterborne Commerce of the United States, 1956-1965.

Exhibit V-6

Total Traffic at Major Atlantic Seaports
1956-1965



SOURCE: United States Army Corps of Engineers, Waterborne Commerce of the United States, 1956-1965

imports was diverted to the Seaway in 1965.* On the other hand, estimates of the diversion of bulk cargo tonnage run as high as 50%.** How does this affect the Port of Boston? Approximately 5% of Boston's tonnage originates or is destined to the midwest trade area.*** Boston has already lost a substantial portion of its midwest grain tonnage. With a base of only 5%, the Seaway's impact on Boston will not be significant. The Port of New York handles a much higher percentage of general cargo originating in the Midwest and is affected to a greater extent.

C. VESSEL TRENDS AND PROJECTIONS

1. Increasing Vessel Size

At the end of World War II, the "T-2" standard size petroleum vessel had a capacity of 16,160 dead weight tons (dwt). That same year the first of the super-tankers (the definition of super-tanker changes with each new generation of ships) was constructed with a capacity of 28,000 dwt. Over the period 1949 to 1965 a typical U.S. tanker increased from 15,000 to 25,000 dwt. In 1966 over one-third of the world tanker fleet was composed of vessels of 30,000 dwt or larger. Under construction are vessels of 312,000 dwt, and 400,000 dwt ships are currently being planned.

Dry bulk vessels have not grown to such great size as have the tankers. Nevertheless, the number of vessels having a capacity of 30,000 dwt have grown from 2% of the fleet in 1953 to 16% of the fleet in 1966 and currently represent about 40% of the world's dry bulk capacity.

The growth of general cargo ships has been at a slower pace than that of bulk carriers. The required draft for ships projected in 1970 range from 36 feet for freighters to 72 feet for tankers.

The principal advantage of larger vessels is that of economies of scale. Capital costs and operating costs per dwt are reduced as vessel size increases. The result is substantial reduction in transportation costs. Exhibit V-7 shows historic and projected vessel size in draft.

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* <u>Ibid</u>., p. 77.

** <u>Ibid</u>., p. 65.

*** Rowland and MacNeal, <u>op</u>. <u>cit</u>., pp. 5-16.

Exhibit V-7

Historic and Projected Vessel Sizes
1945-2000

	1945	1966	1970	1980	1990	2000
DWT						
Freighters			25,500	33,500	43,500	50,000
Bulk Carriers	7,000	12,000	105,000	185,000	317,000	400,000
Tankers	28,000	205,000	300,000	760,000	1,000,000 1/	1,000,000 1/
Required Draft						
Freighters			36	39	40	40
Bulk Carriers			48	57	66	71
Tankers	35	63	72	98	104	104

1/ Uppermost practical limit based upon projected technology and experience.

Source: United States Army Corps of Engineers, Port Development and Redevelopment: A Problem and an Opportunity.

2. Port Problems Caused by Vessel Size

Only 10% of the world's ports and only three U.S. ports have controlled channel depths exceeding 47 feet. The problems of enlarging and deepening ports are tremendous. Demographic limitations are imposed by commercial and military installations located at the water's edge. Vehicular tunnels, bridges, and rights of way also impose growth restrictions. The continental shelf is a serious problem facing all U.S. North Atlantic ports. It lies about 50 feet below water level and thus places a depth limitation on potential deepening of harbors. It is reasonable to expect that major ports may require moderate dredging to increase depths to handle 40 foot draft freighters. However, this will not be a serious problem requiring action during the next decade. Bulk vessels pose the only foreseeable draft problem. The world's tanker fleet is rapidly shifting to jumbo vessels. At this point, and within the time and cost limitations of this report, it is impossible to determine the extent that jumbo tankers could be utilized for providing New England's petroleum needs if adequate facilities were available. As shown in Exhibit V-4 (p. 228), petroleum products represent the single largest import through New England's ports.

3. Governmental Concern

Four questions thus become important: (1) To what extent would jumbo tankers be used to serve New England if facilities were available? (2) What will be the impact on New England's economy if the use of jumbo tankers is feasible? (3) If off-shore terminals are required, where should they be located? (4) To what extent will public funds be required to provide adequate terminals?

The question is often raised as to why New England petroleum prices do not reflect its advantageous geographical location. New England is closer than Texas to foreign oil locations yet there appears to be an upcharge added to New England petroleum based on the Texas price. The extent that this price is determined by refinery location and/or marketing policy of oil companies is not known, but there may be a failure to exploit a natural transportation advantage. The subject is of sufficient importance to the New England economy that the New England Regional Commission should direct further study of this problem.

D. CONTAINERIZATION

1. Impact on World Trade

The container revolution promises to have a large impact on world trade. The container concept has been in wide-spread use in domestic transportation for the past decade, and while its impact has been significant, it has not had a revolutionary effect on domestic distribution practices. The main reason for this is that an efficient domestic transportation system exists that does not rely upon the interchange of equipment between different modes of transportation. International trade, except for those rare shipments both originating and terminating in port cities, requires intermodal transportation. The container, because it minimizes many problems of intermodal transfer of equipment and because intermodal exchange is essential to foreign trade, will thus have a greater impact on foreign than it has had on domestic commerce.

Containerization will significantly reduce the cost of international trade by reducing (1) handling, (2) damage, (3) packaging requirements, (4) transit time, and (5) pilferage, all of which now add substantial cost to international trade.

In most cases, container rates have been patterned after traditional existing ship rates. Thus, value of service is an important segment of current container rates. The low valued commodities are often handled in bulk where breakage or pilferage is not a serious problem. Rates, heavily weighted toward value of service concepts, will not result in a shift of low valued commodities to containers. (A Port of New York Authority report of 1967 tonnages illustrates this value concept--ocean-borne trade accounted for 53,539,097 long tons valued at $12.83 billion, or $238 per ton. Airborne trade was 186,824 long tons valued at $3.34 billion, or about $18,000 per ton.*) Thus it is likely that current container rates will not enable containerization to reach its maximum potential. The industry is already talking of "freight all kinds" rates or some other rate concept more closely related to cost. As competitive pressures increase, rate-making innovations will be established thereby increasing the competitiveness of containers. This trend toward cost-based rates, plus the economies of scale of containerization, will lead to lower ocean rates that will further encourage international trade.

The container concept is exerting pressure to solve other problems of international trade. The Department of

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*Traffic World, April 13, 1968, p. 28.

Transportation's Office of Facilitation and an industrial group, the National Committee on International Trade Documentation, are already making good progress on updating regulations and removing the paperwork bottleneck of international trade. Within five years much progress will have been made toward the modernization of the whole archaic system of trade documentation, thus removing one road block to efficient world-wide distribution of products.

The ease of intermodal transfer of containers is creating pressure to establish door-to-door international rates thus reducing the uncertainty involved in predetermining international transportation costs.

The above factors, plus continuously improving communications and more favorable trade attitudes between nations, may well result in an unprecedented growth in world trade during the next three decades.

2. Economies of Scale

Containerization is changing the steamship industry from a labor-oriented to a capital-oriented industry. This is one reason why the United States has a very strong position in the container revolution--American skills are oriented to capital-intensive activities. At present, wages, maintenance, repairs, and the like represent about 80% of a shipping company's cost while capital costs represent 20%. Containerization reverses this ratio. The cost of two 1200-container container ships equals the cost of 6-1/2 new freighters. And that is only the beginning. New port facilities are needed, an example being the new $175 million facility at Elizabeth, New Jersey. American steamship operators alone are spending $250 million for container ships and planning to spend more.

A study of containerization by McKinsey and Company* predicts that labor productivity will increase twenty times to 600 freight tons per man-week and general cargo berths will increase utilization from about 125,000 tons per year to two million tons. The study points out that this could drop port costs from their present $42 per ten-ton container to $8.40. This is substantiated by port figures showing that a break-bulk ship can load about 15 tons of general cargo an hour whereas a container ship loads 300 tons an hour.

3. Centralization of Traffic

To realize the economies of scale of containerization, a full commitment must be made. In order to utilize expen-

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*McKinsey and Company, Study for the British Transport Docks Board.

sive container ships efficiently, ports of call must be limited. The traditional schedule of stopping at several ports will be changed to stopping at one or two ports. Economies indicate that it will be cheaper to send container freight longer distances overland to a main loading port than have an express container ship call on many ports along the coast. Boston's ability to attract container-ship service is hindered by its proximity to New York and the better service offered by New York because of greater frequency of sailings. Better service is the largest single reason why New England shippers prefer New York over Boston.* Thus, Boston must compete with New York's greater frequency of service and the ease with which containers can be moved overland from the New England area to the New York port. Two factors may limit severe restriction on ports of call: national pride and overcapacity of container service leading to stiff competition between steamship companies. For transatlantic trade the ideal arrangement from an efficiency standpoint is to have one or two ports in Europe and one or two ports in the United States. National interests are high in Europe because of pride and the fact that countries believe a container port is essential in order to remain competitive. Thus, Amsterdam, Rotterdam, Antwerp, London, Gothenberg, Stockholm, Hamburg, Bremen, and others are all aggressively promoting container ship business to their ports. Competition between ports is high in the United States but the national interest factor is not present. At the present time, New York, Baltimore, and Hampton Roads are the main U.S. ports considered for transatlantic container trade.

4. Overcapacity and Competition

Steamship companies have been forced to enter the container race to remain competitive. With more companies operating container ships than can be economically justified, overcapacity will result. Studies by McKinsey and Company** show that 25 ships of less than 2000 containers each could handle the entire European-North American general cargo trade. This number of ships can only be efficiently operated by three or four companies, whereas there are about thirty currently plying the North Atlantic trade routes. Economies of scale will promote greater cooperation to share facilities among steamship companies. The formation of more consortiums will be an economic necessity. Thus, the inefficient or undercapitalized companies will be merged, resulting in a reduction of the number of carriers. With competition reduced, the remaining carriers will be in a stronger position to centralize ports of call. It will probably take five to ten years for this amalgamation to occur.

*Rowland and MacNeal, op. cit., p. 6-2
**McKinsey and Company, op. cit.

It is estimated by the Journal of Commerce* that in 1968 container capacity can provide 175,000 container-trips whereas only 150,000 containers will be shipped. Capacity will increase 85% to 325,000 container-trips by 1969 moving an estimated 225,000 loads thus resulting in supply exceeding demand by about 100,000. The effects of high start-up costs and insufficient demand are already being felt. All steamship companies currently operating containerships on the North Atlantic trade route have reported losing money on the operation for the first quarter of 1968.

The need to fill containers will result in rate competition. Regulation of European land rates is not very extensive and the first juggling of rates will be in that area. Already steamship lines are starting to subsidize part of the inland haul in order to attract business. Once this activity has run its course, pressure will be directed to reducing ocean rates.

5. Future Outlook

For the next five years the factors of over-capacity, competition, and national interests will exert pressure against the concentration of traffic at a few ports of call. It will be during the period when these factors are the strongest that the Port of Boston will be in the best position to attract container ship business. As competition is reduced and as demand approaches supply, the trend to fewer ports of call and concentration of traffic will become stronger. However, trade patterns once established are difficult to change and the possibility of maintaining service therefore appear fairly good.

6. Containerization at the Port of Boston

Container ship facilities have been constructed in Boston which are currently under lease to Sea-Land Service Inc. Labor problems and assignment of ships to Vietnam service have delayed inauguration of service. According to Sea-Land officials an agreement has been negotiated with the union that will allow the handling of Sea-Land's containers at the Port of Boston. Thus, as soon as ships are available, Sea-Land will presumably commence transatlantic service using New York-Boston as the U.S. ports of call. Using this set of circumstances the desirability of having more than one major container ship service available to provide competition for Sea-Land and having service available to points not served by Sea-Land becomes a question of importance to the New England region. The ability of Boston's port trade area to support more than one carrier thus becomes a pivotal question. If the need for additional service is indicated

*New York Journal of Commerce, May 14, 1968.

and if additional facilities are required to attract this service, providing the facilities becomes the paramount concern. If additional facilities represent over-capacity and will be unprofitable from a revenue standpoint the question then centers around the economic impact upon the area if the service is not available. It may be better to face some over-capacity than to make a decision that might deprive a local or regional economy of its chance to compete in the world market. The three main factors affecting Boston's ability to attract container ship service are: (a) volume of available container tonnage, (b) handling and related costs, and (c) availability of container handling facilities.

a. Volume of Available Container Tonnage

A sophisticated detailed study of Boston's potential container tonnage is not possible within the time and cost limitations of this report. However, a few rough guidelines can be established and may be of assistance in focusing attention on this problem.

(1) Economic Feasibility of Adding the Port of Boston to New York-Europe Container Ship Service

Do the economies of scale so restrict the container ship ports of call as to eliminate Boston as a potential container ship port? A study produced by McKinsey and Co.* shows that it is economical for a 1000 capacity container ship to divert 500 miles to pick up 300 containers. Exhibit V-8 shows the container-diversion cost relationship for various capacity container ships. The graph indicates that a 1000 capacity container ship can economically be diverted 100 miles to an additional port of call for about 160 containers (McKinsey used a standard of 20-foot ten-ton containers) and that a 2000 capacity ship could be diverted 100 miles for about 260 containers. Depending on the route used, diverting a ship on the New York-European trade route to stop at Boston involves about 100 miles.

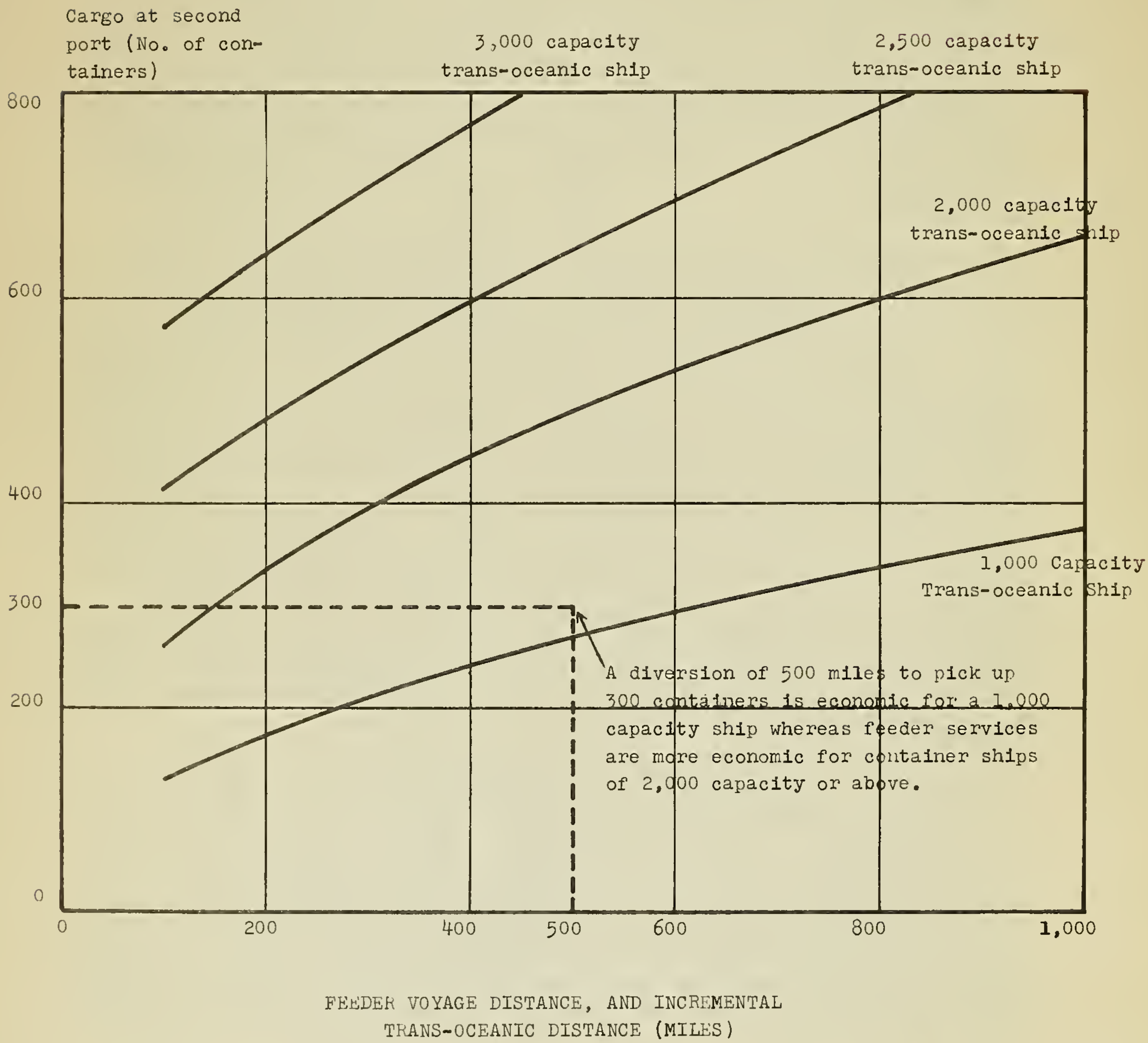
(2) Port of Boston Container Potential in the North Atlantic Trade Route

Exhibit V-9 shows tonnage between Boston and various European cities for 1966 and relates this tonnage to container loads. If 200 containers were exchanged at each call, assuming that 50% of available general cargo between the selected cities was containerized, the 12,000 containers would support about 60 calls a year. The selected cities represent about three-fifths of the tonnage moving between Boston and Europe. At this point, it would be speculative

*McKinsey and Co., op. cit.

Exhibit V-8

BREAK-EVEN BETWEEN FEEDER AND PORT-OF-CALL SERVICES
(ABOVE EACH CURVE A PORT OF CALL SERVICE HAS THE LOWER COST;
BELOW EACH CURVE A FEEDER SERVICE HAS THE LOWER COST)



SOURCE: McKinsey and Co., Study for the British Docks Board, 1967

Tonnage Between Boston and Various European Ports - 1966

Between Boston and City*	Import & Export Tonnage	Assuming 80% Containerization: Number of 10-Ton Containers	Assuming 80% Containerization: Number of 15-Ton Containers	Assuming 50% Containerization: Number of 10-Ton Containers	Assuming 50% Containerization: Number of 15-Ton Containers
Antwerp	95,960	7,677	5,118	4,798	3,199
Liverpool	50,384	4,031	2,687	2,519	1,679
Rotterdam	46,248	3,700	2,467	2,312	1,541
Bremen	32,986	2,639	1,759	1,649	1,099
Hamburg	27,561	2,205	1,470	1,378	919
Goteborg	23,075	1,846	1,231	1,154	769
Naples	16,802	1,344	896	840	560
Le Havre	15,295	1,224	816	765	510
Genoa	14,879	1,190	793	744	496
London	12,337	987	658	617	411
Glasgow	9,925	794	529	496	331
Rijeka	7,075	566	377	354	236
Manchester	4,303	344	229	215	143
Dublin	2,322	186	124	116	77
Barcelona	1,221	98	65	61	41
	360,373	28,831	19,219	18,018	12,011

*Those cities having imports to Boston of over 10 million pounds in 1966 and those cities having exports from Boston of over one million pounds in 1966, except Gydnio, Hanko, Copenhagen and Leghorn.

SOURCE: U.S. Department of Commerce, Bureau of the Census, U.S. Waterborne General Imports of Merchandise, SA305 and SA305-IT, Washington, 1966; U.S. Department of Commerce, Bureau of the Census, U.S. Waterborne Exports of Merchandise, SA705 and SA705-IT, Washington, 1966.

Exhibit V-9

to estimate what percentage of the remaining two-fifths would be consolidated through container ports. The ability of this tonnage to attract service in addition to that offered by Sea-Land is marginal and, as pointed out earlier, would only be desirable to steamship companies in a highly competitive over-capacity market.

The ability to attract a high percentage of the 1,100,000* tons not moving through the Port of Boston depends on the frequency of service. With adequate container facilities and costs more competitive with other ports, it is reasonable to assume that additional service would attract a good percentage of this tonnage. In terms of 15-ton containers and 50% containerization, 1,100,000 tons represents 37,000 containers. If a significant portion of this tonnage could be diverted to the Port of Boston, it would enable Boston to support adequately two container ship services offering frequent sailings.

b. Handling and Related Costs

Boston has traditionally been a high cost port mainly due to high stevedoring costs. Exhibit V-10 shows a comparison of cost factors between selected Atlantic ports. These figures are based on 1962 costs but there have not been any recent significant changes to alter the relationship between ports. The potential of the Port of Boston is directly related to its labor problems. The ability of the Port to compete with other Atlantic ports must be improved. No solution appears to this problem short of substantial increases in the utilization of labor, an increase that requires complete revision of port labor agreements. The effect of higher port costs is to make the port less attractive to steamship operators because a greater amount of tonnage is required to make stopping at the port profitable. Thus higher port costs curtail service which diverts tonnage to other ports, thus further reducing available tonnage resulting in additional service limitations. A vicious cycle results. This cycle could undoubtedly work in reverse, if some stimulus could be found to improve service and thus attract more tonnage. It is tempting to consider breaking this cycle with a subsidy, but the situation is already so beset with the U.S. maritime subsidy policy, the restrictions of steamship conferences, and severe labor restrictions, that such a compounding of the complications is not recommended.

Another possibility of breaking the cycle may soon appear. Exhibit V-10 shows that Boston has a slight advantage on costs not related to stevedoring (the top five items in the exhibit) but has substantially higher stevedoring costs than the other ports.

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*Rowland and MacNeal, op.cit.

Exhibit V-10

Cost Per Ton of Handling 500 Tons

	Boston	New York	Phila-delphia	Balti-more	Hampton Roads
Cost per ton:					
Pilotage	$.39	$.36	$.39	$.49	$.36
Tug hire	.14	.15	.22	.36	.97
Line handling	.13	.10	.04	.08	.08
Dockage	.20	.60	.78	.35	-
Wharfage against ship	-	-	.50	.15	-
Stevedoring, basic	7.50	6.40	6.00	5.10	4.06
CC&W, basic	3.98	3.00	2.38	.78	.37
Overtime					
"Normal"	2.60	2.17	1.94	1.36	1.02
From sailing schedule	.76	-	.25	.47	.34
Total	$15.70	$12.78	$12.50	$9.14	$7.20

Source: Rowland and MacNeil, "Port of Boston Water-Borne Commerce Market," 1964.

Containerization greatly increases labor productivity and will give Boston an opportunity to become more competitive cost-wise with other Atlantic ports. Unless restrictive labor practices are imposed, the mere use of containers should enhance Boston's position relative to other ports because that portion of the cost where Boston is the highest will be significantly reduced. The fact that Boston's higher costs have restricted service resulting in the diversion of tonnage to other ports (mainly New York) should not be overlooked. Tonnage originating at or destined to Boston's port market area not moving to the Port of Boston has been estimated at over 1,100,000 tons annually.* Using 50 cents per cwt as the estimated average domestic transportation cost differential between Boston and New York, this diversion is costing New England industry about $11 million a year. In addition to higher land costs, New England loses the economic effect which would have been felt if the diverted tonnage had moved to the Port of Boston.

This is not a Massachusetts problem. It affects all of New England and the New England Regional Commission should do everything within its power to enable the Port of Boston to become more competitive. Labor contracts more in line with other Atlantic ports are necessary. If restrictive labor practices are allowed to be carried over to the handling of containers, Boston could easily be bypassed as a container ship port.

c. Availability of Container Handling Facilities

The diversion of tonnage to other than New England ports increases costs for New England industry. Boston is the only New England port with sufficient potential to attract container ship service. If container handling facilities are not available at the port and if costs are not competitive with other Atlantic ports, the economies of scale of containerization will cause a continuing and increasing erosion of tonnage handled through Boston. This will place New England industry located in the Port's lower rate area in a less favorable competitive position and cause a further loss of port-generated revenue. The New England Regional Commission should take an active part in further determining the advisability of constructing additional container ship facilities by studying in depth the effect of adequate container ship service on New England's economy.

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*Rowland and MacNeal, op. cit., pp. 5-18.

E. WATER TRANSPORT

From its overwhelming dominance in colonial and early national history, coastwise transportation has dwindled to little more than the movement of fuel. Coastwise general cargo steamers once connected New England ports with those to the south, providing (jointly with the railroads serving the southern ports) through service to the country's interior at rates kept differentially below all-rail rates. This service finally ended, however, with World War II, along with the famous Sound steamers between New York and various New England ports. Undoubtedly the most famous of these was the Fall River Line, an example of the rail-water coordination so typical of early New England transportation. Overnight steamers connected at Fall River with fast trains to and from Boston. Similar service was provided at almost every port.

Now, however, only bulk cargos come by ship. Oil is the cargo which moves virtually entirely by this mode. Fortunately there appears to be little need for governmental protection of this movement. Private oil companies provide the necessary facilities and equipment. The only areas to which it is desirable to call attention are those already mentioned under section C. above, relating to the possibility of introducing jumbo tankers and the question of the relation of fuel prices to transportation cost.

Oil moves into New England from the ports by truck and in a few instances by pipe line. There have been isolated and sporadic examples of rail movements from the ports to the interior.

Coal moves partly by coastwise vessel and partly by rail into the region. The development of unit trains, discussed in chapter II, is expected to dominate the future movement of coal to interior points, but presumably coastwise vessels will continue for the foreseeable future to supply power plants located on navigable water.

There is also a regular passenger service in New England waters. Water carriage of passengers is a tiny portion of national passenger travel (Exhibit II-17, page 57) but a considerable portion of the national total shown represents New England coastal service. Even Vermont, New England's only inland state, has ferry service across Lake Champlain.

Appendix A
Further Details of New England Rail Service

1. New England's Freight Gateways

a. New York Gateway

The details of New England's rail freight service can best be described by points of connection with railroads to the west, usually referred to as the New England gateways. (Exhibits A-1 - A-5 inclusive) The most southerly of these is New York Harbor, the interchange point being referred to in railroad parlance as Harlem River. This gateway is served by the New Haven, which operates a fleet of car floats and tugs to connect with the Pennsylvania, the Jersey Central and the Lehigh Valley. The rail tunnels connecting Manhattan with New Jersey and Long Island are restricted to passenger traffic, and all freight traffic is moved by marine operation, resulting in expense, delay and fog interruption. Nevertheless, the New York gateway is one of New England's largest. The former Pennsylvania was the largest of the New Haven's connections, the Lehigh Valley being the least. The Jersey Central bridges the gap between the New Haven and the Reading-C&O-B&O, avowed merger partners of the N&W. All of these roads also interchange with the New Haven at Maybrook by use of the intermediate Lehigh and Hudson River Railway.

b. Maybrook Gateway

Maybrook is the next northerly New England gateway, located just west of the Hudson River and reached by the New Haven over the famous Poughkeepsie Bridge. In addition to the L&H, which provides indirect connection to the lines indicated above, the New Haven connects at Maybrook with the Erie-Lackawanna, whose volume vies with that of the former PRR for the position of largest of the New Haven's connections. Maybrook handles about the same volume as New York, and since both gateways are served exclusively by the New Haven, the combination of the two makes the New Haven clearly of the first importance in the task of moving New England's interregional freight.

c. Interior Junctions

The New Haven also moves interregional freight which has entered New England (or will leave New England) by the Selkirk gateway of the Penn Central, described below. This freight the New Haven interchanges with the Penn Central at the interior junctions of Pittsfield, Westfield, Springfield, Worcester or Framingham, whichever is nearer to the New England destination or origin. Similarly, the New Haven now handles interregional freight moving through the Mechanicville

Exhibit A-1

MOVEMENT OF CARS INTO AND OUT OF NEW ENGLAND THROUGH HUDSON RIVER GATEWAYS - 1962***

Hudson River Gateway	Cars into New England				Cars out of New England				Total	
	Loads	Empties	Total	Percent of Total	Loads	Empties	Total	Percent of Total	Cars	Percent of Total
Harlem River*	154,663	37,363	192,026	26	71,341	119,081	190,422	26	382,448	26
Mechanicville	144,135	24,070	168,205	23	60,252	90,982	151,234	21	319,439	22
Rotterdam Junction	59,413	14,410	73,823	10	20,752	53,167	73,919	10	147,742	10
Maybrook	162,540	11,031	173,571	24	56,199	114,763	170,962	23	344,533	23
Selkirk	118,264	8,804	127,068	17	36,664	109,945	146,609	20	273,677	19
Totals**	639,015	95,678	734,693	100	245,208	487,938	733,146	100	1,467,839	100
Percent	87	13	100		33	67	100			

*Includes Jersey City, Bay Ridge, Fresh Pond, Greenville, and Port Morris

**Does not include interchange at Chatham, N.Y.; Poughkeepsie, N.Y.; Campbell Hall, N.Y.; Beacon, N.Y.; Troy, N.Y.; Eagle Bridge, N.Y., amounting to about 1% of combined total.

NOTE:

***Later data is unavailable, but 1962 shows relative importance of the gateways

SOURCE: ADL, "The New England Railroads Study," op. cit., Exhibit IV-1

Exhibit A-2

LOADED CARS INTERCHANGED BETWEEN NEW ENGLAND RAILROAD
AND CONNECTING LINES AT HUDSON RIVER GATEWAYS - 1962*
(A)

Connecting Line	New England Railroad	Loaded Cars Delivered by New England Railroad		Loaded Cars Received by New England Railroad		Total	
		Cars	%	Cars	%	Cars	%
NYC	B&A	26,740	100	118,359	100	155,099	100
Total		26,740	100	118,359	100	155,099	100
NYC	B&M	20,762	26	59,999	29	80,761	28
D&H	B&M	60,358	74	145,296	71	205,654	72
Total		81,120	100	205,295	100	286,415	100
NYC	NH	4,428	3	14,033	4	18,461	4
PRR	"	49,178	39	106,480	35	155,658	36
E-L	"	35,495	27	84,671	27	120,166	27
CNJ	"	21,769	17	78,610	25	100,379	22
LV	"	5,018	4	29,494	9	34,512	8
LIRR	"	13,476	10	1,770	-	15,246	3
NYS&W	"	325	-	1,550	-	1,875	-
L&H	"	15	-	275	-	290	-
Total		129,704	100	316,883	100	446,587	100
Grand Total		2 7,564		640,537		888,101	
Percent of Grand Total		28		72		100	

*See Note on Exhibit A-1

(A) As the L&H is primarily an overhead carrier on traffic to and from New England, the cars interchanged between the L&H and New Haven have been separated to show the cars moving via the carriers west of the L&H. (Source: Special L&H Report)

SOURCE: ADL, "The New England Railroad Study," op. cit., Exhibit IV-3

Exhibit A-2

Exhibit A-3

LOADED CARS INTERCHANGED BETWEEN NEW ENGLAND RAILROADS AND CONNECTING LINES AT HUDSON RIVER GATEWAYS SHOWING CARS HANDLED BY EACH CONNECTING LINE AND PERCENT OF TOTAL - 1962*

Connecting Line	New England Railroad	Total Cars	Percent of Total
NYC	B&A, B&M, NH	254,321	28
D&H	B&M	205,654	23
PRR	NH	155,658	18
E-L	"	120,166	14
CNJ	"	100,379	11
LV	"	34,512	4
LIRR	"	15,246	2
NYS&W	"	1,875	-
L&H	"	290	-
Totals		888,101	100

*See Note on Exhibit A-1

SOURCE: ADL, "The New England Railroad Study," op. cit., Exhibit IV-5

Exhibit A-4

DISTRIBUTION OF LOADED CARS DELIVERED AND RECEIVED
BY SOUTHERN NEW ENGLAND RAILROAD AND GATEWAY, 1962*

Gateway	New England Railroad	Connecting Railroad	Cars Delivered by N.E. Railroads	Cars Received by N.E. Railroads	Loaded Cars Interchanged	Percent of Total Interchanges
Harlem River, N.Y.	NH	PRR	36,851	92,270	129,121	
	NH	CNJ	15,594	34,290	49,884	
	NH	LV	3,258	15,284	18,542	
	NH	LIRR	13,476	1,770	15,246	
	NH	NYC	2,162	11,035	13,197	
		Subtotal	71,341	154,649	225,990	19.8
Maybrook, N.Y.	NH	L&H	27,107	91,165	118,272	
	NH	E-L	28,990	68,071	97,071	
		Subtotal	56,097	159,236	215,333	18.9
Mechanicville, N.Y.	B&M	D&H	60,252	144,135	204,387	17.9
Selkirk, N.Y.	B&A	NYC	36,664	118,264	154,928	13.6
Portland, Me.	B&M	MEC	47,702	74,886	122,588	
	B&M	CN	1,473	1,799	3,272	
		Subtotal	49,175	76,685	125,860	11.0
Rotterdam Jct., N.Y.	B&M	NYC	20,752	59,413	80,165	7.0
Wells River-Woodsville, Vt.	B&M	CP	12,058	35,036	47,094	4.1
New London, Conn.	NH	CV	10,241	19,634	29,875	2.5
White River Jct., Vt.	B&M	CV	6,027	17,451	23,478	2.1
Brattleboro, Vt.	B&M	CV	5,277	9,002	14,279	1.3
Other Hudson River**	NH	NYC	2,458	4,804	7,262	0.6
Palmer, Mass.	B&A	CV	4,182	2,506	6,688	0.6
Whitefield, N.H.	B&M	MEC	439	960	1,399	0.2
Lancaster, N.H.	B&M	MEC	289	780	1,069	0.2
Millers Falls, Mass.	B&M	CV	660	122	782	0.1
Other Canadian Connections***	B&M	CV	282	397	679	0.1
Groveton, N.H.	B&M	CN	139	160	299	-
Joint Trains	B&M	CV	29	228	257	-
Willimantic, Conn.	NH	CV	16	163	179	-
Intervale, N.H.	B&M	MEC	2	90	92	-
Norwich, Conn.	NH	CV	4	-	4	-
Total			336,384	803,715	1,140,135	100.0

*See Note on Exhibit A-1

**Campbell Hall, Poughkeepsie, Beacon, Troy, Eagle Bridge and Chatham

***Includes 16 interchange points between the B&M and the B&A, CV, MEC and NH

SOURCE: ADL, "The New England Railroad Study," op. cit., Appendix 1

Exhibit A-5

PERCENTAGE OF TRAFFIC INTERCHANGED BY B&M AND NH
WITH EACH OF THEIR HUDSON RIVER CONNECTIONS
1962*

B & M	Percent of Total Carloads Interchanged at Hudson River Gateway
NYC	28
D&H	72
Total	100

NH	
PRR	36
NYC	4
E-L	27
LV	8
CNJ	22
LIRR	3
Total	100

*See Note on Exhibit A-1

SOURCE: ADL, "The New England Railroad Study," op. cit., Exhibit III-29

gateway of the B&M, connecting with the New Haven at the interior junctions of Springfield, Worcester, Fitchburg and Lowell. The volume of such movement is indicated in Exhibit A-6.

d. Selkirk Gateway

Selkirk, apparently soon to become one of the two major gateways to New England and newly-equipped as a major electronic classification yard, is the third in geographical order of the present points of entry, counting from the south, lying just west of the Hudson south of Albany. It has been for many years the smallest of the four major gateways, generally accounting for about two-thirds of the volume of either New York or Maybrook. Unlike the others, Selkirk is not primarily an interchange point, the Penn Central operating the lines on both sides.

e. Mechanicville Gateway

Mechanicville, on the west bank of the Hudson north of Troy, is the largest New England gateway, its volume exceeding that of either New York or Maybrook by about one-third. It is the interchange point between the B&M and the Delaware and Hudson. In addition, Penn Central trains from the west continue through Rotterdam Junction (the physical connecting point between Penn Central and B&M) without stopping and for 22 miles farther east to Mechanicville. Thus, although nominally different interchange points, the physical work attendant on interchange and classification for both is performed at Mechanicville. The D&H, whose volume of interchange is twice as great as that of the PC, links the B&M with the former Pennsylvania, Erie-Lackawanna, Lehigh Valley and the Jersey Central, the last-named being the link to the Reading and C&O-B&O.

f. White River Junction Gateway

In addition to the four major gateways just described, there is one minor gateway serving most of New England which handles a noteworthy volume. This is White River Junction, at the junction of the White and Connecticut Rivers. It is also a junction between the B&M and Central Vermont. The B&M's interchange with the Canadian Pacific is at Wells River, Vermont, forty miles away, but by agreement trains run through to White River Junction, a movement similar to that between Rotterdam Junction and Mechanicville. Thus White River Junction is in effect the New England gateway for the Canadian roads, with a volume which is less than half that of Selkirk, the smallest of the major gateways until the Penn Central merger. White River Junction is an important gateway for the movement of freight between New England (other than Maine)

Exhibit A-6

RANK ORDER OF MAJOR INTERCHANGE POINTS WITHIN NEW ENGLAND - 1962*

Interchange Point	Interchanging Roads	Delivering Carrier		Cars Delivered	% Loaded	Receiving Carrier	Cars Received	% Loaded	Total Cars Interchanged
Portland, Me.	MEC, B&M	MEC		108,706	69	MEC	122,157	39	230,863
	B&M, CNR	B&M		4,176	35	B&M	2,582	70	6,758
	MEC, PTC	MEC		1,316	3	MEC	2,559	1	3,875
			Total	114,198	67		127,298	39	241,496
Worcester, Ma.	B&M, NH	B&M		55,722	72	B&M	56,592	53	112,314
	B&M, B&A	B&M		4,645	39	B&M	3,466	55	8,111
	NH, B&A	NH		9,411	35	NH	8,898	84	18,309
			Total	69,778	65		68,956	57	138,734
Northern Maine Jct.	BAR, MEC	BAR		57,473	76	BAR	58,351	27	115,824
Springfield, Ma.	B&M, NH	B&M		33,421	76	B&M	30,086	45	63,507
	NH, B&A	NH		22,448	36	NH	17,004	73	39,452
	B&M, B&A	B&M		3,066	45	B&M	1,456	41	4,522
			Total	58,935	59		48,546	55	107,481
Wells River-Woodsville, Vt.	B&M, CP	B&M		38,268	32	B&M	39,074	90	77,342
Boston, Ma.	NH, B&A	NH		11,516	14	NH	13,278	91	24,794
	B&M, NH	B&M		7,834	70	B&M	6,487	74	14,321
	B&M, B&A	B&M		8,177	28	B&M	3,805	63	11,982
			Total	27,527	34		23,570	82	51,097
New London, Conn.	NH, CV	NH		26,306	39	NH	29,064	67	55,370
White River Jct., Vt.	B&M, CV	B&M		15,612	39	B&M	20,264	86	35,876
Framingham, Ma.	NH, B&A	NH		17,693	20	NH	11,085	86	28,778
Brattleboro, Vt.	B&M, CV	B&M		11,517	46	B&M	11,704	77	23,221
Lowell, Ma.	B&M, NH	B&M		9,181	84	B&M	10,778	27	19,959

*See Note on Exhibit A-1

Interchange Point	Interchanging Roads	Delivering Carrier	Cars Delivered	% Loaded	Receiving Carrier	Cars Received	% Loaded	Total Cars Interchanged
Brownville Jct.,Me.	BAR, CP	BAR	9,073	90	BAR	7,196	10	16,269
Palmer, Ma.	B&A, CV	B&A	5,434	77	B&A	7,365	34	12,799
Pittsfield, Ma.	NH, B&A	NH	2,403	40	NH	2,985	28	5,388
Fitchburg, Ma.	B&M, NH	B&M	2,836	88	B&M	1,495	44	4,331
Holyoke, Ma.	B&M, NH	B&M	1,457	74	B&M	1,354	52	2,811
Whitefield, N.H.	MEC, B&M	MEC	1,256	77	MEC	996	44	2,252
St. Leonard, Me.	BAR, CN	BAR	548	31	BAR	1,175	32	1,723
	BAR, CP	BAR	49	2	BAR	238	94	287
		Total	597	29		1,413	41	2,010
Lancaster, N.H.	MEC, B&M	MEC	964	81	MEC	744	39	1,708
Westfield, Ma.	NH, B&A	NH	1,121	12	NH	520	93	1,641
North Adams, Ma.	B&M, B&A	B&M	818	72	B&M	596	32	1,414
Millers Falls, Ma.	B&M, CV	B&M	660	100	B&M	655	19	1,315
Clinton, Ma.	B&M, NH	B&M	408	85	B&M	476	26	884
Groveton, N.H.	B&M, CN	B&M	181	77	B&M	508	32	689
Dover-Foxcroft, Me.	BAR, MEC	BAR	464	77	BAR	198	88	662
Northampton, Ma.	B&M, NH	B&M	331	88	B&M	259	27	590
Willimantic, Ct.	NH, CV	NH	171	9	NH	165	99	336
Easthampton, Ma.	B&M, NH	B&M	120	17	B&M	130	86	250
Intervale, N.H.	MEC, B&M	MEC	90	100	MEC	104	2	194
W. Concord, Ma.	B&M, NH	B&M	80	21	B&M	93	81	173
Norwich, Ct.	NH, CV	NH	4	100	NH	1	-	5
Joint Trains	B&M, CV	B&M	40	73	B&M	241	95	281

SOURCE: ADL, "The New England Railroad Study," op. cit., Appendix 2

and Canada, but the greater portion moves between New England and most of the United States via Canada. Volume of traffic interchanged with the Canadian roads is shown in Exhibit A-7.

2. New England's Short Lines

As explained in Chapter II, there is no precise definition of a short line, but the definition of short lines in New England used here will be all roads except the Class I roads described in Chapter II and the leased lines to be listed later. (Leased lines might become short lines upon termination of their lease.) Some of the short lines, such as the Hoosac Tunnel and Wilmington, were originally built as such and were never part of a larger road. Some of them, such as the Claremont and Concord, were formerly branches of a Class I road which were abandoned and revived as short lines. Others, such as the Grafton and Upton, exist primarily to serve particular shippers (the Grafton and Upton serves The Draper Division of North American Rockwell Corporation in Hopedale, Mass., but it is a common carrier.) Some of them, like the Springfield Terminal, are owned by larger railroads (ST is owned by the B&M) but most of them are independently owned by individuals or small groups.

One which is of especial interest because it leases its track from a state is the Vermont Railway, whose line is owned by the State of Vermont. The line is the longest short line in New England, stretching from Bennington to Burlington, with connections to the CV, D&H and B&M. When the Rutland Railway was abandoned, the State of Vermont purchased most of the right of way within the state. The portion delineated above was leased to Vermont Railway, a corporation founded for the purpose, at a rate which recovers the state's investment and financing costs. The result is that the industries served are making greater use of the line than they did in the dying years of the Rutland. The new company is making money, and the state is recovering its cost in cash, with the economic stimulus of the service as a sort of fringe benefit. Another portion of the former Rutland from Rutland to Bellows Falls was similarly leased to the Green Mountain Railroad which, although primarily a rail fan and summer tourist excursion operation, does provide common carrier freight service. The significance to this report of this unusual if not unprecedented action of a state in acquiring an abandoned rail line is that it provides a demonstrated plan for future action. Its success clearly recommends that in future rail abandonment proceedings, the state investigate the practicability of purchasing the line at net salvage and offering it to competitive bidding for operator's lease. Investigation could reduce the risk and an undertaking at no ultimate cost to the state could be reasonably expected. The

Exhibit A-7

CARS INTERCHANGED WITH CANADIAN RAILROADS*- 1962**

Railroad and Interchange Point	Connecting Carrier	Cars Delivered to Connections			Cars Received from Connections			Total		
		Loaded	Empty	Total	Loaded	Empty	Total	Loaded	Empty	Total
Bangor & Aroostook										
Brownsville Jct., Me.	CP	8,176	897	9,073	708	6,488	7,196	8,884	7,385	16,269
St. Leonard, Me.	CP	1	48	49	225	13	238	226	61	287
St. Leonard, Me.	CN	169	379	548	353	822	1,175	522	1,201	1,723
BAR Total		8,346	1,324	9,670	1,286	7,323	8,609	9,632	8,647	18,279
Percents		86	14	100	15	85	100	53	47	100
Boston & Albany										
Palmer, Ma.	CV	4,182	1,252	5,434	2,506	4,859	7,365	6,688	6,111	12,799
Percents		77	23	100	34	66	100	52	48	100
Boston & Maine										
Groveton, N.H.	CN	139	42	181	160	348	508	299	390	689
Portland, Me.	CN	1,473	2,703	4,176	1,799	783	2,582	3,272	3,486	6,758
Wells River-Woodsville, Vt.	CP	12,058	26,210	38,268	35,036	4,038	39,074	47,094	30,248	77,342
Brattleboro, Vt.	CV	5,277	6,240	11,517	9,002	2,702	11,704	14,279	8,942	23,221
Millers Falls, Ma.	CV	660	1	661	122	533	655	782	534	1,316
White River Jct., Vt.	CV	6,027	9,585	15,612	17,451	2,813	20,264	23,478	12,398	35,876
Joint Trains	CV	29	11	40	228	13	241	257	24	281
Other Stations	CV	282	57	339	397	217	614	679	274	953
B&M Total		25,945	44,849	70,794	64,195	11,447	75,642	90,140	56,296	146,436
Percents		37	63	100	85	15	100	62	38	100
New Haven										
New London, Ct.	CV	10,241	16,065	26,306	19,634	9,430	29,064	29,875	25,495	55,370
Norwich, Ct.	CV	4	-	4	-	1	1	4	1	5
Willimantic,Ct.	CV	16	155	171	163	2	165	179	157	336
New Haven Total		10,261	16,220	26,481	19,797	9,433	29,230	30,058	25,653	55,711
Percents		39	61	100	68	32	100	54	46	100
Grand Total		48,734	63,645	112,379	87,784	33,062	120,846	136,518	96,707	233,225
Percents		43	57	100	73	27	100	59	41	100

*Does not include Maine Central Railroad traffic

**See Note on Exhibit A-1

SOURCE: ADL, "The New England Railroad Study," op. cit., Exhibit IV-21

Exhibit A-7

collateral economic benefits to the state would include rail service to the industries on the line and strengthening of incentives to industrial location.

Parenthetically, it is interesting to note that the provision of the right-of-way by a state for a rail common carrier resembles the provision of highways for motor common carriers. There are differences, however. The Vermont Railway, unlike motor carriers, maintains the state-owned track and, in addition, pays charges as a proportion of gross revenue, unlike the user charges (erroneously called taxes) paid by the trucks. No clearer exposition of the difference of attitude of the state toward the two modes could be found than a decision of the Vermont Highway Department during negotiation concerning the Vermont Railway. The Highway Department insisted on leaving a gap in the maintenance of any highway at the point where it crossed the railroad, the intervening twenty feet or so to be maintained by rail forces. It would be hard to find a more inefficient division of labor. Clearly, the concept of a coordinated transportation policy is so foreign to the country's culture that it will require strong policy orders to filter down to all concerned.

The short lines of New England are listed in Exhibit A-8.

3. Leased Lines in New England

Leased lines are so called becaused they are leased to and operated by one of the larger railroads. As such, they are included in the description of the larger road in Chapter II and have no further significance to the purposes of this report unless the lease terminates. In addition to the three-mile Houlton Branch Railroad of the Canadian Pacific and small terminal roads, there are four roads leased to the New Haven and three to the B&M. The possibility of cancellation of the New Haven's leases has arisen in connection with the reorganization of that road. One of the New Haven's leased lines, the Providence and Worcester, has made a careful study of its ability to survive such a cancellation with the result that it is prepared and the region probably need not fear the loss of its service, but less knowledge is available as to the plans of the others. This possibility is the reason for the recommendation in Chapter I that the Commission establish a regional office of transportation, one of whose functions would be to offer technical assistance to any leased line whose service is endangered. A list of such roads follows on page 258.

Exhibit A-8

NEW ENGLAND'S SHORT LINES

Name	Miles*	Ownership	Location	Formerly Part of:	Connections with:
Aroostook Valley RR Co.	32	CPR	Northern Maine	-	CPR
Belfast & Moosehead Lake RR Co.	33	City of Belfast	Central Maine	-	MEC
Claremont & Concord Railway Co.	34	Independent	Western New Hampshire	B&M	B&M
Clarendon & Pittsford RR Co.	17	Vermont Marble	Western Vermont	-	VTR, D&H
Grafton & Upton RR Co.	15	Draper Corp.	Eastern Mass.	-	PC,NH
Green Mountain RR Corp.	37	Independent	Central Vermont	RUT	B&M, VTR, D&H
Hoosac Tunnel & Wilmington RR Co.	11	Independent	Western Mass. and Southern Vermont	-	B&M
Montpelier & Barre RR Co.	15	Independent	Northern Vermont	B&C, CV	CV
Moshassuck Valley RR Co.	2	Independent	Pawtucket, R.I.	-	NH
Narragansett Pier RR Co.	7	Independent	Southern R.I.	-	NH
St. Johnsbury & Lamoille County RR	96	Independent	Northern Vermont	-	MEC, CV, CPR
Springfield Terminal Railway Co.	6	B&M	Eastern Vermontc	-	B&M,
Vermont Railway, Inc.	129	Independent	Western Vermont	RUT	B&M, D&H, CV, GMR
		Switching and Terminal Companies			
Berlin Mills	13	Brown Paper	Berlin, New Hampshire	-	B&M, GT
Boston Terminal	10	PC, NH	So. Station, Boston	-	PC, NH, UF
Fore River	6	General Dymanics	Quincy, Mass.	-	NH
Portland Terminal	110	B&M, MEC	Portland, Maine	-	B&M, MEC
Union Freight	4	B&P, NH	Boston, Mass.	-	B&M, NH, PC
Van Buren Bridge	**	BAR	Van Buren, Maine	-	BAR, CNR
Warwick Railway	1	Independent	Cranston, R.I.	-	NH

*Miles of road for short lines; miles of track for switching companies
**Less than ½ mile

SOURCE: ICC Transport Statistics, op. cit., Railroad Annual Reports

Leased Lines	Miles Operated	Lessor	Lease Expires
Boston & Providence	62	NH	Indefinite
Holyoke & Westfield	10	NH*	Perpetuity
Northern	69	B&M†	1989
Norwich & Worcester	71	NH	1969
Providence & Worcester	50	NH	1991
Stony Brook	11	B&M†	1989
Vermont & Massachusetts	60	B&M	2873

The location of the New Haven's leased lines is obvious from their names. The Northern is the northern end of the B&M's direct line from White River Junction to Boston. The Stony Brook forms a part of the line which connects Maine with both Worcester and Mechanicville. The Vermont and Massachusetts is part of the west end of the B&M's main line east from Mechanicville.

4. Relative Importance of Various New England Load Centers

A study of the freight problems of New England by Arthur D. Little, Inc., for the U.S. Department of Commerce (op. cit.) indicates the relative importance of the freight traffic volume of the different parts of the region in terms of freight volume and revenue. Exhibit A-9 lists different "load centers" in the decreasing order of their volume. It should be remembered that this refers to terminating and originating freight, not movement or interchange. The interchange volume at the various gateways described above is in fact the freight originating and terminating at these load centers as it enters and leaves New England.

Boston is by far the largest, as might be expected. The second is Harlem River. This represents terminations and origins at New York City on the New Haven Railroad only (a small portion of the city's freight). Although not in New England, it is included because it represents service of a New England railroad.

After New Haven, in third place, comes Millinocket, Maine. It is especially interesting to note how prominent are these Maine load centers on the list in general, indicating a freight-producing characteristic of that state disproportionate to its population.

"B&A" in the railroad column of the exhibit refers to the Boston and Albany division of the Penn Central. The Bangor and Aroostook is referred to as "BAR".

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*City of Holyoke owns majority of stock

†B&M owns majority of stock

Exhibit A-9
RANK ORDER OF LOAD CENTERS ON THE FIVE
NEW ENGLAND RAILROADS - 1962

Rank Order No.	Load Center	Railroad	Number of Cars Terminated	Originated	Total	Percent of Total N.E. Traffic (Cumulative)
1	Boston, Mass.	NH, B&M, B&A	240,836	78,800	319,636	22.35
2	Harlem River, N.Y.	NH	35,524	18,310	53,834	
3	New Haven, Conn.	NH	28,305	19,947	48,252	
4	Millinocket - East Millinocket, Me.	BAR	25,706	21,288	46,994	
5	Providence, R.I.	NH	33,555	12,031	45,586	35.97
6	Springfield, Mass.	NH, B&M, B&A	31,053	9,935	40,988	
7	Hartford, Conn.	NH	30,850	2,895	33,745	
8	Worcester, Mass.	NH, B&M, B&A	23,845	9,153	32,998	
9	Portland, Me.	B&M, MEC	13,515	16,955	30,470	
10	Bridgeport, Conn.	NH	21,085	3,865	24,950	
11	Holyoke, Mass.	NH, B&M	19,512	4,871	24,383	
12	Waterbury, Conn.	NH	13,756	4,811	18,567	50.38
13	Searsport, Me.	BAR	2,632	13,059	15,691	
14	Brattleboro, Vt.	B&M	6,393	8,842	15,235	
15	Fitchburg, Mass.	NH, B&M	10,545	4,318	14,863	
16	Rumford, Me.	MEC	8,605	5,179	13,784	
17	Lawrence, Mass.	B&M	9,970	2,980	12,950	
18	Bucksport, Maine	MEC	3,701	8,665	12,366	
19	Manchester, N.H.	B&M	9,536	2,687	12,223	
20	Westbrook-Cumberland Mills-Deering Jct., Me.	B&M, MEC	7,254	4,860	12,114	58.02
21	Concord, N.H.	B&M	10,401	1,636	12,037	
22	Framingham, Mass.	NH, B&A	10,452	274	10,726	
23	Berlin, N.H.	B&M	5,792	3,707	9,499	
24	New Milford, Conn.	NH	5,259	3,965	9,224	
25	Derby-Shelton, Conn.	NH	4,146	5,038	9,184	
26	Winslow, Me.	MEC	4,178	4,557	8,735	
27	Middletown, Conn.	NH	8,093	625	8,718	
28	Lowell, Mass.	NH, B&M	6,470	2,091	8,561	
29	Waterville, Me.	MEC	4,988	3,276	8,264	
30	New Bedford, Mass.	NH	6,606	1,098	7,704	
31	Nashua, N.H.	B&M	5,242	1,991	7,233	
32	Mechanicville, N.Y.	B&M	5,104	1,790	6,894	
33	Madawaska, Me.	BAR	1,375	5,515	6,890	
34	Bangor, Me.	MEC, BAR	3,201	3,367	6,568	
35	Westfield, Mass.	NH, B&A	3,397	3,152	6,549	
36	Stratford, Conn.	NH	6,324	150	6,474	
37	Augusta, Me.	MEC	2,332	3,838	6,170	
38	New Britain, Conn.	NH	3,259	2,847	6,106	
39	Rockland, Me.	MEC	1,553	4,402	5,955	
40	Pittsfield, Mass.	NH, B&A	4,563	1,190	5,753	

Rank Order No.	Load Center	Railroad	Terminated	Originated	Total	Percent of Total N.E. Traffic (Cumulative)
41	Caribou, Me.	BAR	3,045	2,699	5,744	
42	Livermore Falls, Me.	MEC	3,839	1,578	5,417	
43	Fall River, Mass.	NH	3,446	1,878	5,324	
44	Great Works, Me.	MEC	3,549	1,456	5,005	
45	Orange-Athol, Ma.	B&M	2,225	2,673	4,898	
46	Houlton, Me.	BAR	2,691	1,840	4,531	
47	Woodland, Me.	MEC	767	3,590	4,357	
48	Ashland, Me.	BAR	317	3,936	4,253	
49	South Brewer, Me.	MEC	2,711	1,479	4,190	
50	Limestone, Me.	BAR	1,611	2,569	4,180	72.37
51	Lewiston, Me.	MEC	3,323	833	4,156	
52	Presque Isle, Me.	BAR	2,385	1,623	4,008	
53	Gardner-Heywood, Ma.	B&M	2,045	1,891	3,936	
54	Portsmouth, N.H.	B&M	2,353	1,448	3,801	
55	Bath, Me.	MEC	318	3,475	3,793	
56	St. Francis, Me.	BAR	38	3,529	3,567	
57	Greenfield, Ma.	B&M	1,784	1,626	3,410	
58	Bridgewater, Ma.	NH	2,113	1,234	3,347	
59	Danbury, Conn.	NH	2,635	640	3,275	
60	Ft. Fairfield, Me.	BAR	587	2,577	3,164	75.13
61	Van Buren, Me.	BAR	740	2,420	3,160	
62	N. Me. Junction, Me.	BAR	3,064	87	3,151	
63	Biddeford-Saco, Me.	B&M	2,745	394	3,139	
64	Taunton, Ma.	NH	3,011	118	3,129	
65	Northampton, Ma.	NH, B&M	1,797	1,265	3,062	
66	Fort Kent, Me.	BAR	1,219	1,831	3,050	
67	Stamford, Conn.	NH	2,381	633	3,014	
68	Lincoln, Me.	MEC	2,214	780	2,994	
69	Fairfield, Me.	MEC	2,926	7	2,933	
70	Poughkeepsie, N.Y.	NH	2,433	481	2,914	
71	Brockton, Ma.	NH	2,231	626	2,857	
72	Norwalk-S. Norwalk, Ct.	NH	2,478	254	2,732	
73	Haverhill, Ma.	B&M	2,466	220	2,686	
74	Madison, Me.	MEC	565	1,850	2,415	
75	Vanceboro, Me.	MEC	18	2,373	2,391	
76	Shawmut, Me.	MEC	77	2,280	2,357	
77	Norwich, Conn.	NH	1,820	524	2,344	
78	Mars Hill, Me.	BAR	318	1,962	2,280	
79	Bellows Falls, Vt.	B&M	1,850	425	2,275	
80	Oakland, Me.	MEC	519	1,644	2,163	
81	Brewer Junction, Me.	MEC	781	1,344	2,125	
82	Lincoln, N.H.	B&M	1,959	108	2,067	
83	Danielson-Dayville, Ct.	NH	1,646	359	2,005	
84	Newport, R.I.	NH	1,901	97	1,998	
85	Keene, N.H.	B&M	1,366	630	1,996	
86	Washburn, Me.	BAR	221	1,756	1,977	
87	New London, Conn.	NH	1,379	588	1,967	
88	Woonsocket, R.I.	NH	1,686	280	1,966	

Rank Order No.	Load Center	Railroad	Number of Cars Terminated	Originated	Total	Percent of Total N.E. Traffic (Cumulative)
89	Eagle Bridge, N.Y.	B&M	26	1,818	1,844	
90	Ayer, Ma.	B&M	1,298	453	1,751	
91	Pejepscot Mills, Me.	MEC	789	923	1,712	
92	Palmer, Ma.	B&A	1,370	239	1,609	
93	N. Adams, Ma.	B&M	1,455	133	1,588	
94	Auburn, Me.	MEC	1,400	123	1,523	
95	Mapleton, Me.	BAR	86	1,423	1,509	
96	Kennebec, Me.	MEC	1,382	78	1,460	
97	Ashland, N.H.	B&M	452	964	1,416	
98	Gardiner, Me.	MEC	1,136	264	1,400	
99	Smyrna Mills, Me.	BAR	13	1,325	1,338	
100	Woodsville, N.H.	B&M	612	716	1,328	
100	Putnam, Conn.	NH	1,095	233	1,328	
101	Veazie, Me.	MEC	1,319	8	1,327	
102	Hartland, Me.	MEC	635	683	1,318	
103	Lebanon, N.H.	B&M	932	202	1,134	
104	Troy, N.Y.	B&M	837	252	1,089	
	Total		781,343	385,707	1,167,050	81.62
	Percent		66.95	33.05	100.00	
	Grand Total Five New England Railroads		952,108	477,829	1,429,937	
	Percent		66.58	33.42	100.00	

SOURCE: ADL, "The New England Railroad Study," op. cit., Exhibit I-8

Exhibit A-10, taken from the same source, shows the revenue earned by the New England railroad (the New Haven) serving the thirty-one southern New England load centers. Not only is the amount of revenue important, but it is significant that the revenue per car varies greatly, and without correlation with distance. This is an example of the influence of value of service (including value of the commodity) on rates.

5. Details of Passenger Volume

In its presentation to the ICC in the 1966 passenger train discontinuance case, Finance Docket 23831, the New Haven Railroad supplied charts indicating the relative volume of passengers carried in Boston and New York commuter service and between these two cities and other points. The charts are reproduced in the following exhibits because they appear to be helpful to an understanding of the discussion of such services in Chapter II.

The commuter service exhibits are as follows:

Exhibit A-11 Passengers into New York
Exhibit A-12 Passengers out of New York
Exhibit A-13 Passengers into Boston
Exhibit A-14 Passengers out of Boston

These exhibits are particularly helpful in that they show the tremendous peaking of the service in the rush hour, one of the most serious causes of the problem of providing viable service. The proposals for coping with the problems mentioned in Chapter II recognize this fact by attempting to increase off-peak volume.

The remaining exhibits, A-15 and A-16, show the relative volume of travel between New York and Boston, respectively, on the one hand, and other large stations on the Shore Line and Springfield Line on the other. The overwhelming prominence of travel between Boston and New York as compared to that between either city and any other is of great significance to the discussion of proposed new service in Chapter II and Appendix B.

6. Financial Condition of New England Railroads

The financial fortunes of New England railroads have changed greatly since their relatively prosperous times in the 1920's. Exhibits A-17 - A-23, inclusive, show comparative income statements for each of the railroads at several points in time. For most of them, the mid-1950's proved to be a downward turning point which, in the case of the New Haven, led to bankruptcy in 1961. While the most obvious

Exhibit A-10

AVERAGE REVENUE PER CAR FOR INTERLINE TRAFFIC HANDLED AT
31 SOUTHERN NEW ENGLAND LOAD CENTERS

New Haven Railroad (Sample Months, 1962-1963)

Rank Order Number	Load Center	Interline Forwarded: Number of Cars	Interline Forwarded: New England Railroad Revenue	Interline Forwarded: Revenue Per Car	Interline Received: Number of Cars	Interline Received: New England Railroad Revenue	Interline Received: Revenue Per Car
1	Boston, Mass.	7,839	$ 818,535	$ 104.42	24,326	$ 2,864,524	$ 117.76
2	Harlem River, N.Y.	317	48,577	153.24	6,163	631,033	102.39
3	New Haven, Conn.	3,659	327,634	89.54	5,659	704,769	124.54
4	Providence, R.I.	2,498	276,277	110.60	10,267	1,311,566	127.75
5	Springfield, Mass.	64	8,750	136.72	1,690	238,511	141.13
6	Hartford, Conn.	739	102,179	138.27	7,967	944,966	118.61
7	Worcester, Mass.	561	88,549	157.84	1,456	225,485	154.87
9	Bridgeport, Conn.	533	73,854	138.56	6,019	778,344	129.31
10	Holyoke, Mass.	428	50,898	118.92	1,886	278,587	147.71
11	Waterbury, Conn.	1,350	200,314	148.38	2,988	416,144	139.27
13	Fitchburg, Mass.	137	21,628	157.87	686	109,387	159.46
17	Framingham, Mass.	13	2,364	181.85	747	128,714	172.31
19	New Milford, Conn.	965	92,839	96.21	1,635	205,071	125.43
20	Derby-Shelton, Conn.	1,257	139,264	110.79	1,228	211,441	172.18
21	Middletown, Conn.	162	38,264	236.20	2,403	341,795	142.24
22	Lowell, Mass.	5	513	102.60	125	18,400	142.20
23	New Bedford, Mass.	308	43,913	142.57	2,040	324,522	159.08
24	Pittsfield, Mass.	75	23,796	317.28	513	94,679	184.56
25	Fall River, Mass.	548	63,272	115.46	1,126	204,960	182.02
26	Taunton, Mass.	30	4,205	140.17	999	153,853	154.01
28	Danielson-Dayville, Conn.	80	6,548	81.85	479	60,953	127.25
29	Newport, R.I.	14	2,635	188.21	381	51,989	136.45
31	Putnam, Conn.	43	9,650	224.42	337	40,250	119.44
	TOTAL, LOAD CENTERS	21,625	$ 2,444,458	$113.04	81,120	$ 10,339,943	$127.46
	TOTAL, ALL CARS IN SAMPLE MONTHS	30,729	$ 3,559,328	$115.83	118,291	$ 15,427,409	$130.42

SOURCE: ADL, "The New England Railroad Study," op. cit.

Exhibit A-10

change which occurred was a sharp drop in freight revenues, the underlying causes are numerous and beyond the scope of this report. The sharp division in financial results between the railroads of northern and southern New England, with the exception of the Rutland, are clear. Chapter II of this report describes in greater detail some of the characteristics of the railroads which cause the differences in the income statements.

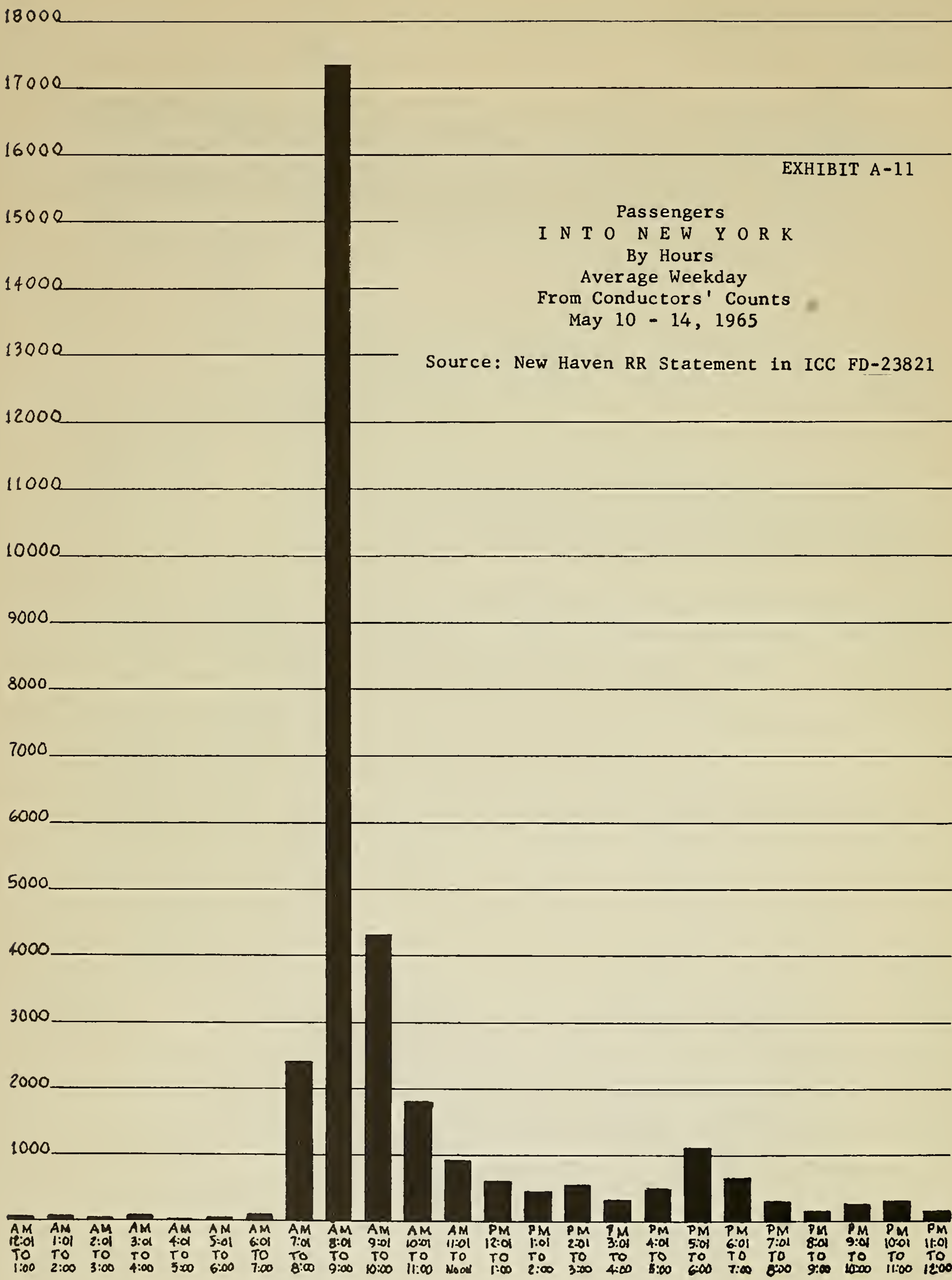


EXHIBIT A-11
Passengers
INTO NEW YORK
By Hours
Average Weekday
From Conductors' Counts
May 10 - 14, 1965
Source: New Haven RR Statement in ICC FD-23821
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
AM 12:01 TO 1:00
AM 1:01 TO 2:00
AM 2:01 TO 3:00
AM 3:01 TO 4:00
AM 4:01 TO 5:00
AM 5:01 TO 6:00
AM 6:01 TO 7:00
AM 7:01 TO 8:00
AM 8:01 TO 9:00
AM 9:01 TO 10:00
AM 10:01 TO 11:00
AM 11:01 TO Noon
PM 12:01 TO 1:00
PM 1:01 TO 2:00
PM 2:01 TO 3:00
PM 3:01 TO 4:00
PM 4:01 TO 5:00
PM 5:01 TO 6:00
PM 6:01 TO 7:00
PM 7:01 TO 8:00
PM 8:01 TO 9:00
PM 9:01 TO 10:00
PM 10:01 TO 11:00
PM 11:01 TO 12:00

EXHIBIT A-12

Passengers
OUT OF NEW YORK
By Hours
Average Weekday
From Conductors' Counts
May 10 - 14, 1965

Source: New Haven RR Statement in ICC FD-23821

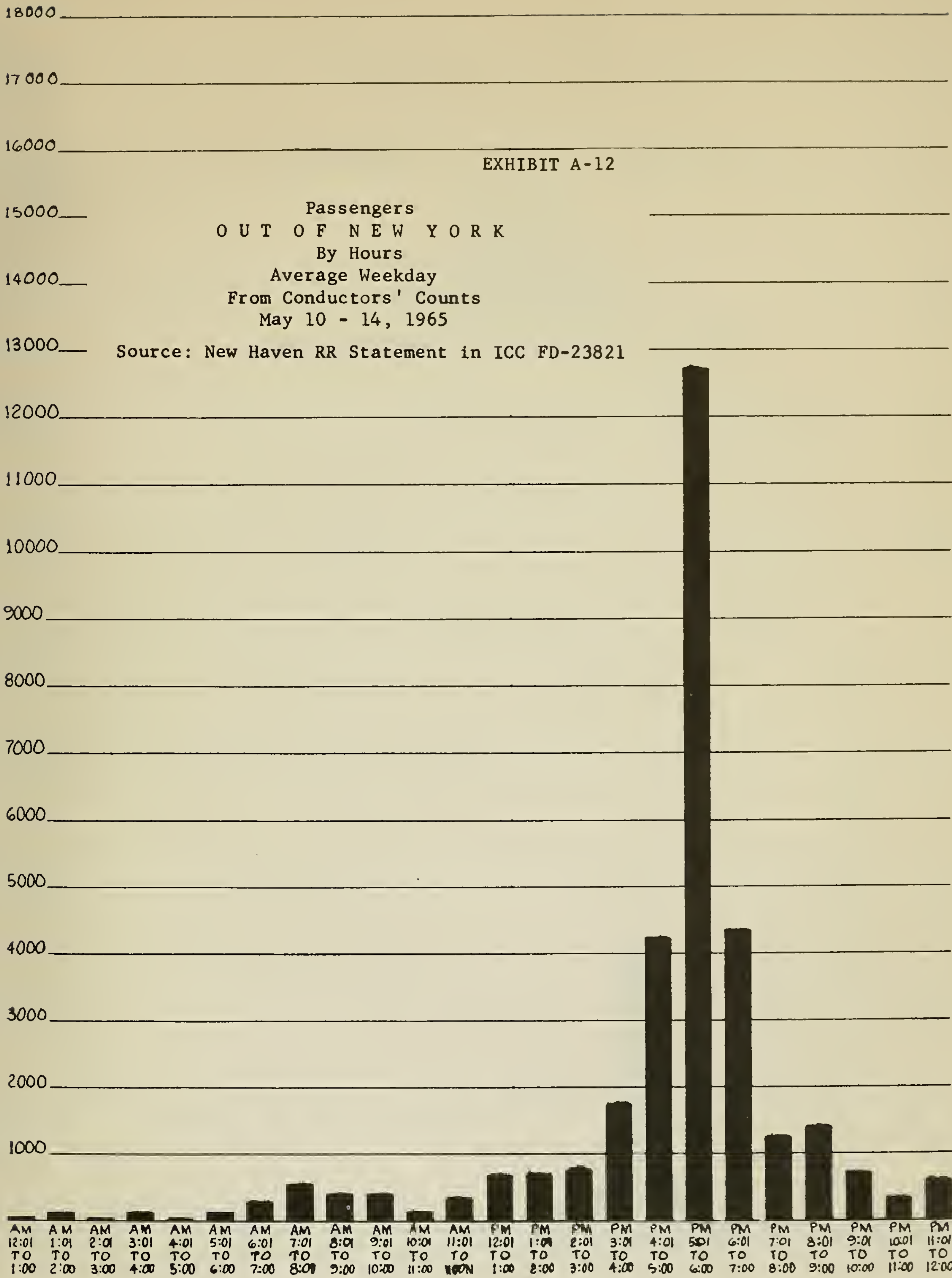


EXHIBIT A-13

Passengers
I N T O B O S T O N
By Hours
Average Weekday
From Conductors' Counts
May 10 - 14, 1965

Source: New Haven RR Statement in ICC FD-23821

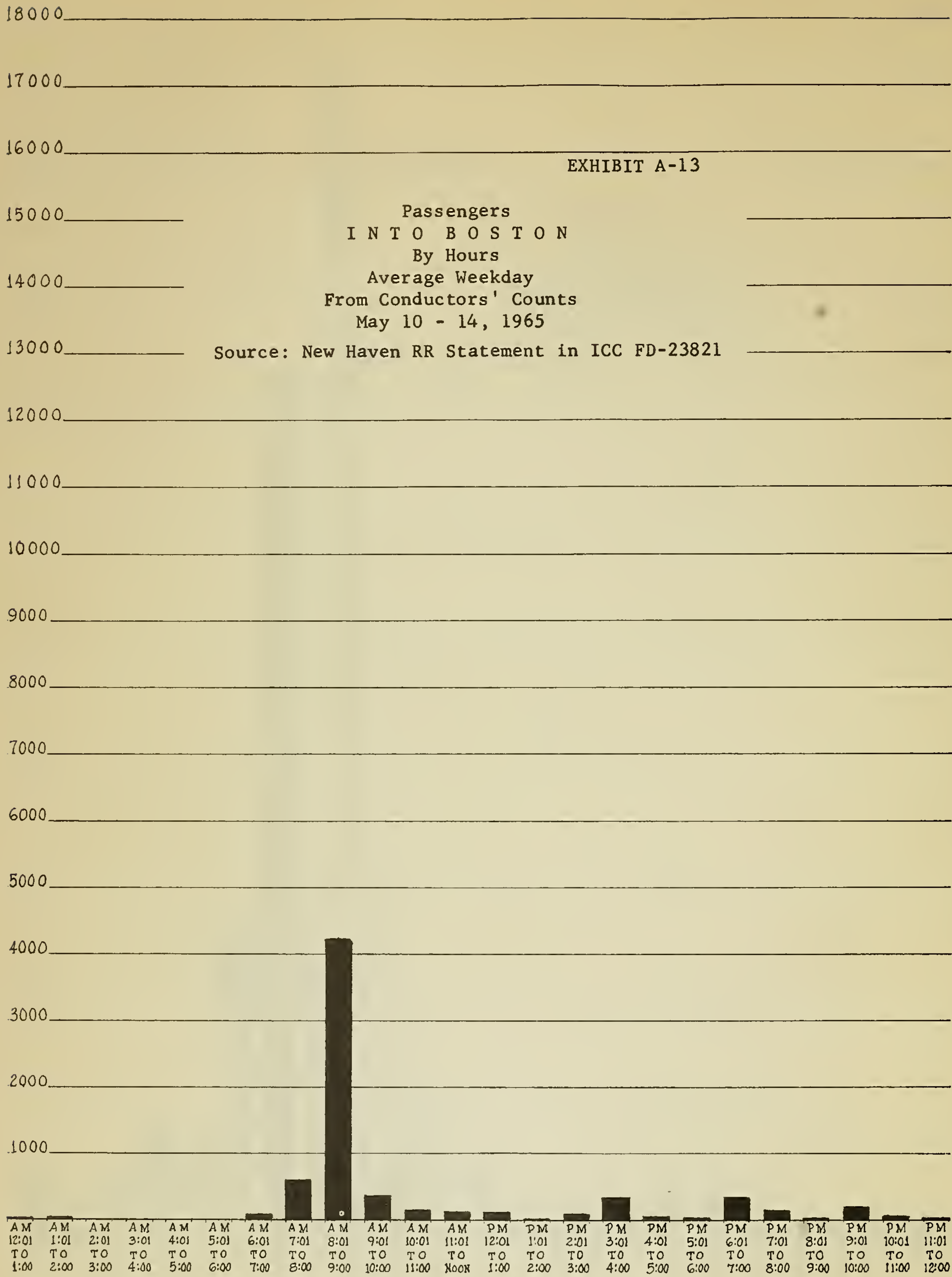
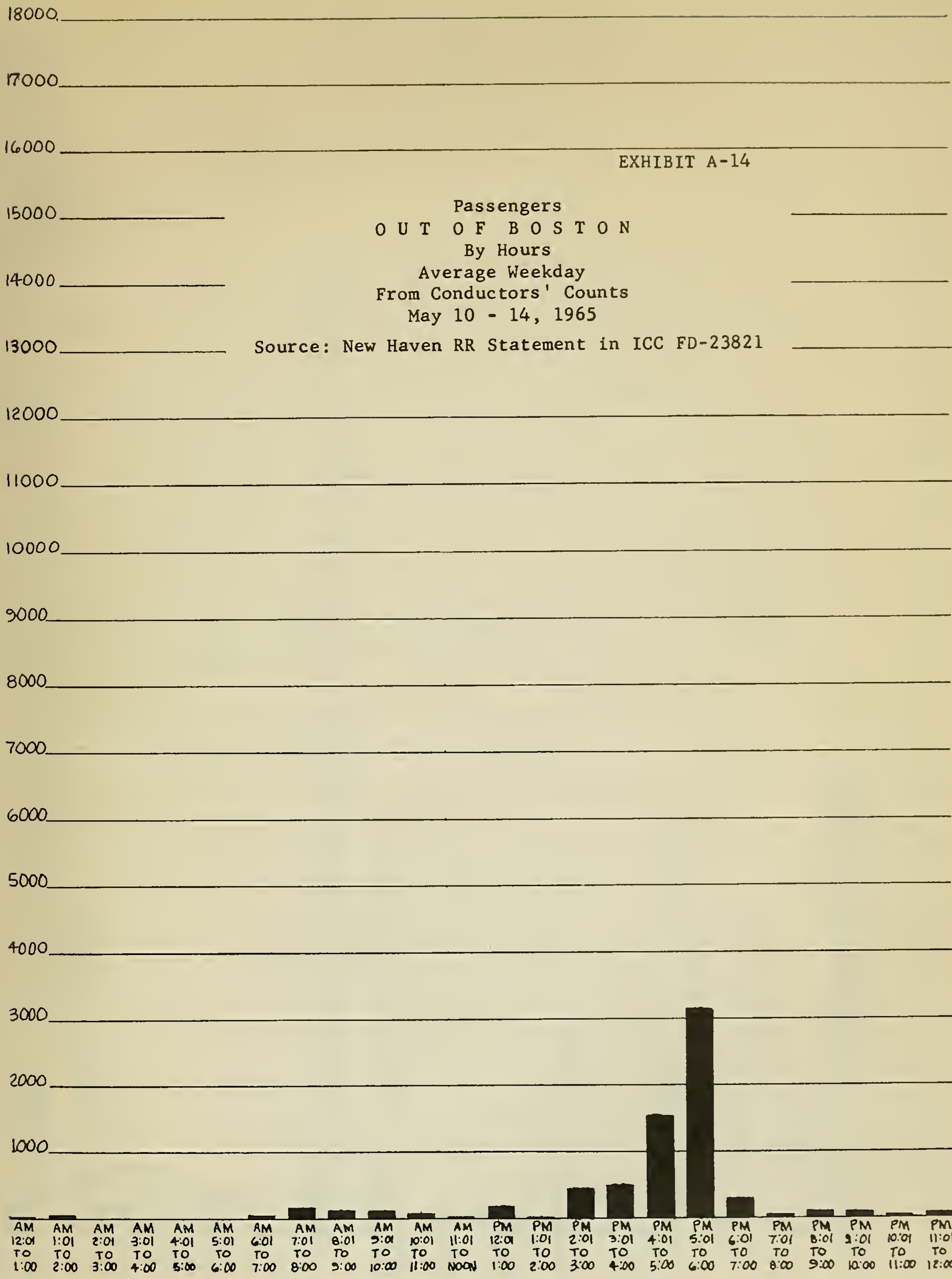


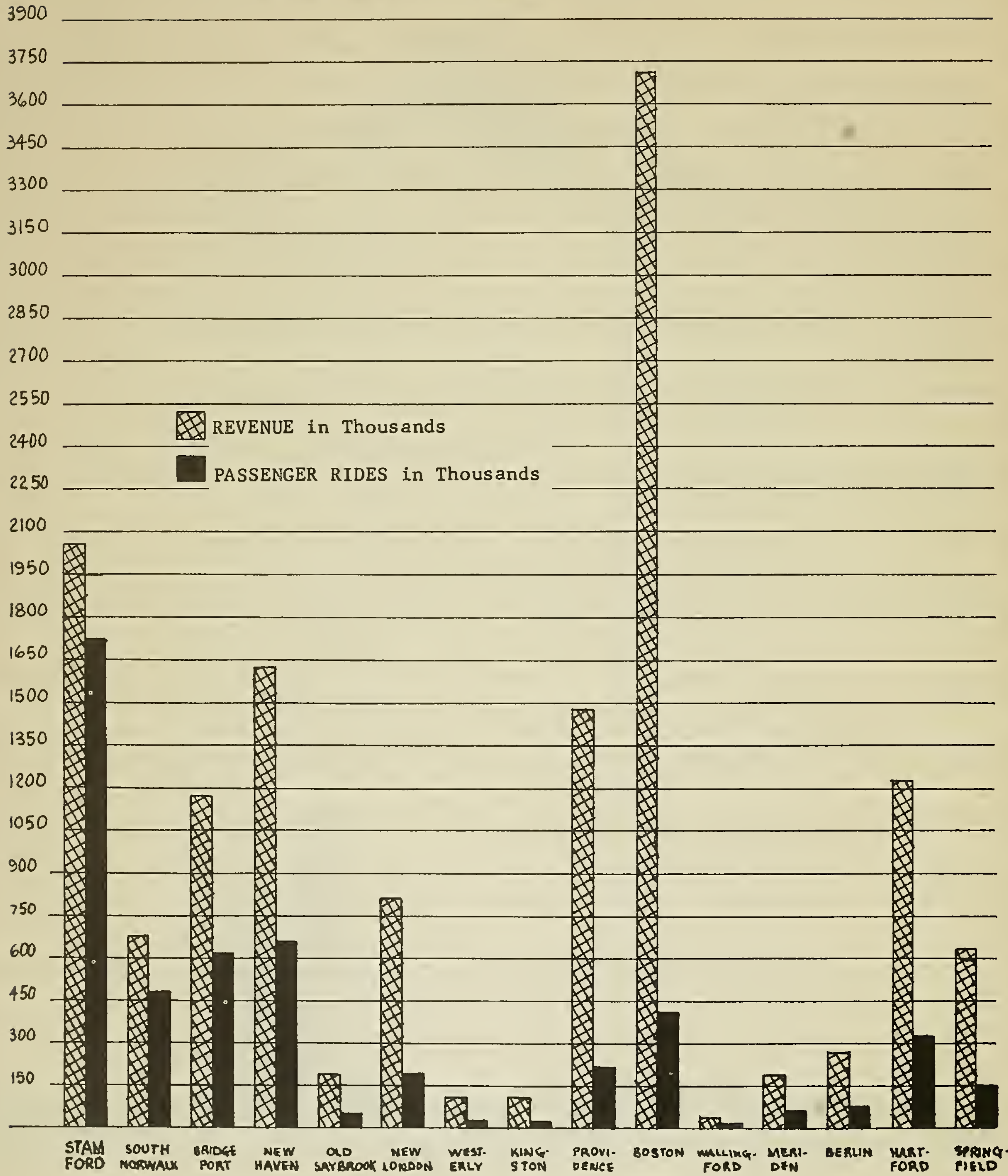
EXHIBIT A-14

Passengers
OUT OF BOSTON
By Hours
Average Weekday
From Conductors' Counts
May 10 - 14, 1965
Source: New Haven RR Statement in ICC FD-23821



Local Ticketed
REVENUE and PASSENGER RIDES
Sold Between
N E W Y O R K
and Principal Stations
Year 1964

Source: New Haven RR Statement in ICC FD-23821



Local Ticketed
REVENUE and PASSENGER RIDES
Sold Between
B O S T O N
and Principal Stations
Year 1964

Source: New Haven RR Statement in ICC FD-23821

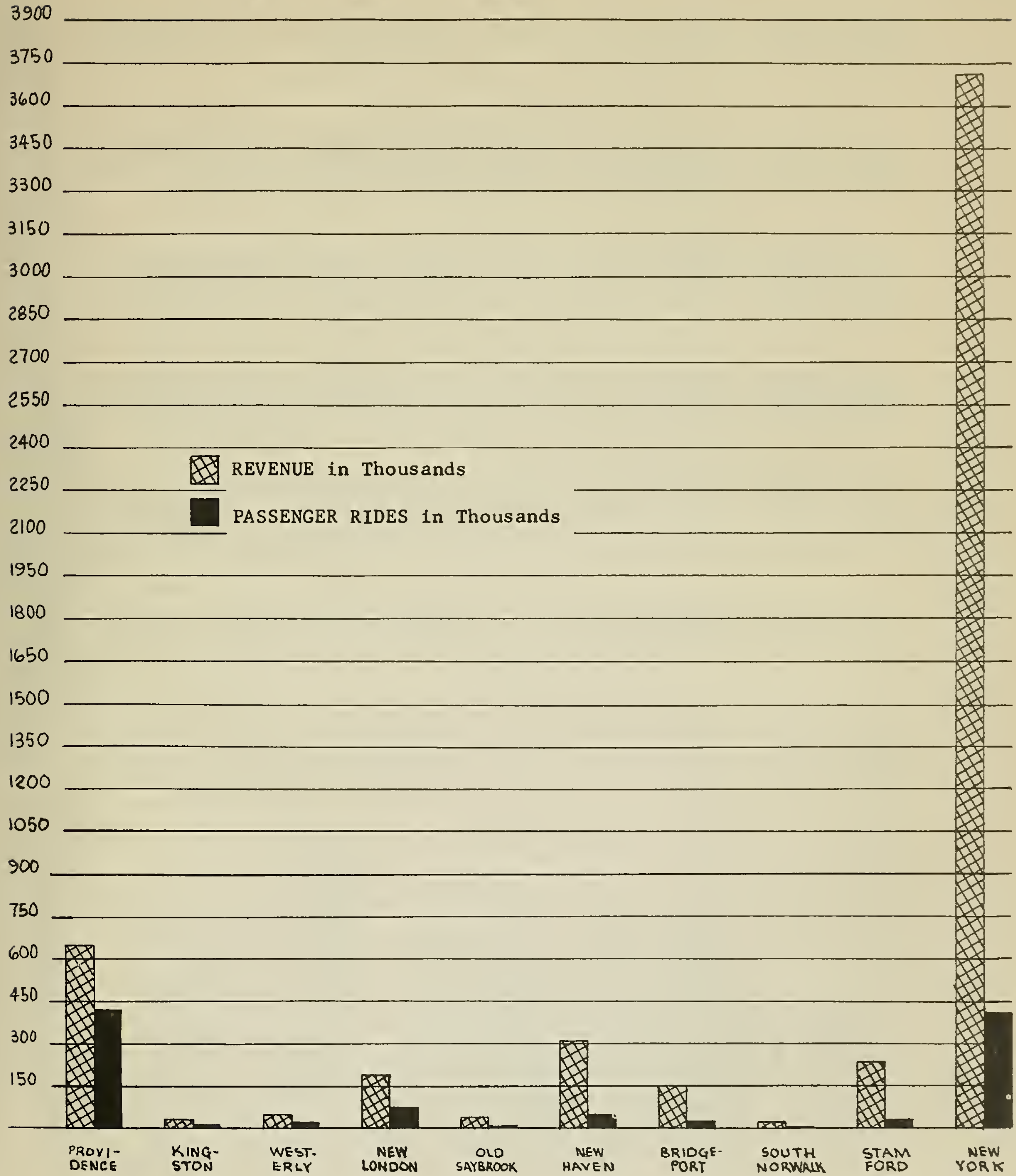


Exhibit A-17

BANGOR AND AROOSTOOK RAILROAD COMPANY

COMPARATIVE INCOME STATEMENTS
(000)

	1929	1939	1950	1956	1958	1961	1963	1967
Operating Revenues:								
Freight Revenue	$ 7,073	$ 4,701	$10,677	$14,893	$13,328	$12,057	$12,281	$13,139
Passenger Revenue	580	183	370	341	274	236	258	245
Other Revenues	482	236	559	567	593	623	468	312
Gross Revenues	8,136	5,119	11,606	15,801	14,194	12,916	13,007	13,696
Operating Expenses:								
Maintenance of Way & Structures	1,304	1,007	2,228	3,200	3,277	2,875	2,896	2,848
Maintenance of Equipment	1,662	999	2,075	3,203	3,420	3,457	3,589	4,385
Transportation Expenses	1,954	1,424	2,945	4,410	4,143	4,004	4,092	4,351
Other Operating Expenses	421	374	759	1,307	1,402	1,285	1,157	317
Total Operating Expenses	5,341	3,803	8,007	12,120	12,242	11,621	11,734	12,901
Operating Ratio	65.64%	74.29%	69.00%	76.71%	86.25%	89.97%	90.21%	94.19%
Net Operating Revenue	2,795	1,316	3,598	3,680	1,952	1,295	1,273	795
Taxes and Rents:								
Federal Income Taxes	(614	(483	857	156	Cr(578)	56	21	-
Payroll Taxes	(	(	306	437	470	546	1,050	795
Other Railway Taxes	(	(	627	764	800	663	-	337
Equipment & Joint Facility Rents	Cr(96)	Cr(113)	Cr(14)	Cr(1,293)	Cr(1,304)	Cr(1,326)	Cr(1,460)	Cr(1,959)
Other								
Total Taxes and Rents	518	370	1,775	64	Cr(612)	Cr(61)	Cr(390)	Cr(828)
Net Railway Operating Income	2,278	946	1,823	3,617	2,562	1,356	1,663	1,623
Other Income	64	62	45	167	272	487	590	1,003
Gross Income	2,342	1,007	1,868	3,784	2,834	1,842	2,252	2,626
Miscellaneous Income Deductions	8	19	4	148	247	401	590	345
Income Available for Fixed Charges	2,334	988	1,864	3,636	2,587	1,442	1,662	2,281
Fixed Charges:								
Interest	935	756	583	782	908	770	731	1,211
Other		19	11	23	48	14		19
Total Fixed Charges	935	772	594	805	955	784	731	1,230
Income After Fixed Charges	1,398	216	1,270	2,831	1,632	658	931	1,051
Contingent Interest				204	200	194	186	167
Net Income	1,398	216	1,270	2,627	1,432	464	745	884

SOURCE: 1929 - 1963 from Railroad Form A, annual reports to the Interstate Commerce Commission and Moody's Manual, published in Lindahl, op. cit.; 1967 from Railroad Form A, annual report to ICC.

Note: Totals may not add because of rounding.

BOSTON AND ALBANY RAILROAD
REPORT OF THE NEW YORK CENTRAL RAILROAD COMPANY AS LESSEE OF THE BOSTON AND ALBANY RAILROAD

COMPARATIVE INCOME STATEMENTS
(000)

	1929	1939	1950	1956	1958
Operating Revenues:					
Freight Revenue	$17,357	$ 9,118	$18,983	$18,988	$15,457
Passenger Revenue	8,781	3,874	6,420	5,412	4,263
Other Revenues	6,315	3,159	7,964	6,929	7,244
Gross Revenues	32,454	16,151	33,367	31,328	26,965
Operating Expenses:					
Maintenance of Way and Structures	4,748	(5,752	4,913	3,787	(7,070
Maintenance of Equipment	6,272	(	6,164	5,117	(
Transportation Expenses	12,305	8,295	16,486	17,759	15,984
Other Operating Expenses	1,980	1,179	2,603	2,774	1,777
Total Operating Expenses	25,306	15,217	30,165	29,437	24,831
Operating Ratio	77.98%	94.22%	90.40%	93.96%	92.09%
Net Operating Revenue	7,148	934	3,202	1,891	2,134
Taxes and Rents:					
Federal Income Taxes	(1,649	(1,895	1,353	322	(2,426
Payroll Taxes	(	(	1,117	1,211	(
Other Railway Taxes	(	(	1,196	1,710	(
Equipment and Joint Facility Rents	1,130	661	1,327	3,184	1,620
Other	3	-	-	-	-
Total Taxes and Rents	2,782	2,556	4,993	6,427	4,046
Net Railway Operating Income	4,366	d(1,622)	d(1,791)	d(4,536)	d(1,912)
Other Income	599	187	219	125	1,124
Gross Income	4,966	d(1,435)	d(1,573)	d(4,412)	d(788)
Miscellaneous Income Deductions	6	128	109	15	13
Income Available for Fixed Charges	4,960	d(1,563)	d(1,682)	d(4,427)	d(800)
Fixed Charges:					
Rent for Leased Roads	248	221	556	404	244
Interest	1,520	1,454	796	424	424
Total Fixed Charges	1,768	1,675	1,352	827	667
Net Income Before Lease Rental	3,192	d(3,238)	d(3,034)	d(5,254)	d(1,468)
Lease Rental for B&A RR. Paid by N.Y.C.	2,000	2,000	2,000	1,990	2,000
Net Income to New York Central	1,192	d(5,238)	d(5,034)	d(7,244)	d(3,468)

SOURCE: Ibid.

Exhibit A-18

Exhibit A-19

BOSTON AND MAINE RAILROAD

COMPARATIVE INCOME STATEMENTS
(000)

	1929	1939	1950	1956	1958	1961	1963	1967
Operating Revenues:								
Freight Revenue	$ 51,917	$ 33,194	$ 65,402	$ 67,941	$ 59,617	$ 56,134	$ 52,170	$ 52,536
Passenger Revenue	16,235	7,094	11,581	10,349	8,683	5,138	5,008	4,260
Other Revenues	10,330	6,054	9,597	9,748	9,135	4,759	6,421	5,819
Gross Revenues	78,481	47,341	86,581	88,038	77,435	66,031	63,599	62,615
Operating Expenses:								
Maintenance of Way & Structures	14,381	5,435	13,958	12,567	10,748	6,874	6,882	8,208
Maintenance of Equipment	13,998	6,896	12,371	11,472	10,581	8,893	9,207	9,694
Transportation Expense	27,005	18,201	35,649	39,899	35,569	29,866	29,417	28,861
Other Operating Expenses	4,025	2,602	4,838	6,798	6,626	4,988	4,453	4,650
Total Operating Expenses	59,409	33,134	66,816	70,736	63,524	50,621	49,959	51,413
Operating Ratio	75.70%	71.50%	77.17%	80.35%	82.04%	76.66%	78.55%	82.11%
Net Operating Revenue	19,072	13,207	19,764	17,302	13,911	15,410	13,640	11,201
Taxes and Rents:								
Federal Income Taxes	(3,496	(3,520	2,814	Cr(403)	Cr(36)	194	168	144
Payroll Taxes	(	(	2,780	3,166	2,749	2,495	2,394	2,934
Other Railway Taxes	(	(	2,982	3,178	3,309	2,278	2,113	1,718
Equipment & Joint Facility Rents	2,926	2,732	4,234	6,602	5,975	7,774	6,178	5,709
Other	8	-	-	-	-	-	-	-
Total Taxes and Rents	6,430	6,252	12,810	12,543	11,997	12,741	10,8	10,506
Net Railway Operating Income	12,642	6,955	6,954	4,759	1,914	2,669	2,787	695
Other Income	1,437	1,197	978	896	778	713	574	1,333
Gross Income	14,079	8,152	7,931	5,655	2,692	3,382	3,361	2,028
Miscellaneous Income Deductions	9	40	39	374	471	702	716	584
Income Available for Fixed Charges	14,070	8,1 2	7,892	5,280	2,221	2,680	2,645	1,444
Fixed Charges:								
Rent for Leased Roads	1,139	1,230	478	475	475	475	454	451
Interest	6,769	6,059	2,631	3,041	4,087	4,643	4,217	3,478
Other	168	115	27	26	36	89	93	180
Total Fixed Charges	8,076	7,404	3,136	3,541	4,598	5,207	4,763	4,109
Income After Fixed Charges	5,994	708	4,756	1,739	d(2,377)	d(2,527)	d(2,119)	d(2,664)
Contingent Charges	-	-	1,180	998	865	753	753	753
Net Income	5,994	708	3,576	741	d(3,242)	d(3,280)	d(2,872)	d(3,417)

SOURCE: Ibid.

CENTRAL VERMONT RAILWAY, INC.

COMPARATIVE INCOME STATEMENTS
(000)

	1929	1939	1950	1956	1958	1961	1963	1967
Operating Revenues:								
Freight Revenue	$ 6,592	$ 4,898	$ 9,290	$ 9,984	$ 9,202	$ 9,170	$ 9,348	$ 7,703
Passenger Revenue	1,202	409	679	727	665	536	535	3
Other Revenues	1,060	484	784	1,188	894	840	721	389
Gross Revenues	8,854	5,802	10,753	11,899	10,761	9,546	9,604	8,095
Operating Expenses:								
Maintenance of Way & Structures	1,650	812	1,825	2,656	3,012	2,395	2,149	1,981
Maintenance of Equipment	1,169	971	1,732	1,255	1,267	1,243	1,231	1,124
Transportation Expenses	3,501	2,506	4,380	4,705	4,395	4,127	4,071	3,507
Other Operating Expenses	556	388	615	678	713	627	532	808
Total Operating Expenses	6,875	4,677	8,552	9,294	9,386	8,392	7,983	7,419
Operating Ratio	77.64%	80.61%	79.53%	78.11%	87.22%	87.91%	83.13%	91.66%
Net Operating Revenue	1,979	1,125	2,201	2,604	1,375	1,154	1,620	676
Taxes and Rents:								
Federal Income Taxes	(208	(295	68	-	-	-	-	-
Payroll Taxes	(	(	333	431	465	513	640	592
All Other Taxes	(	(	153	151	146	126	-	-
Equipment & Joint Facility Rents	Cr(36)	409	712	1,339	1,673	1,291	1,932	1,003
Total Taxes and Rents	173	704	1,265	1,921	2,283	1,929	1,931	1,713
Net Railway Operating Income	1,806	421	936	684	d(908)	d(775)	d(311)	d(1,037)
Other Income	90	38	52	70	170	86	76	183
Gross Income	1,896	459	988	754	d(738)	d(688)	d(236)	d(854)
Miscellaneous Income Deductions	6	6	1	7	4	21	157	8
Income Available for Fixed Charges	1,889	453	986	747	d(743)	d(710)	d(392)	d(861)
Fixed Charges:								
Rents for Leased Roads	217	327	234	-	-	-	-	-
Interest	1,004	902	875	875	696	680	680	680
Other	17	2	1	1	3	-	-	-
Total Fixed Charges	1,237	1,231	1,110	876	699	680	680	680
Income After Fixed Charges	652	d(778)	d(124)	d(128)	d(1,442)	d(1,390)	d(1,072)	d(1,541)
Contingent Interest	-	-	-	-	-	-	-	-
Net Income	652	d(778)	d(124)	d(128)	d(1,442)	d(1,390)	d(1,072)	d(1,541)

SOURCE: Ibid.

Exhibit A-21

MAINE CENTRAL RAILROAD COMPANY

COMPARATIVE INCOME STATEMENTS

(000)

	1929	1939	1950	1956	1958	1961	1963	1967
Operating Revenues:								
Freight Revenue	$ 14,754	$ 9,873	$ 20,230	$ 24,490	$ 22,544	$ 21,436	$ 20,676	$ 23,277
Passenger Revenue	3,096	985	1,606	1,153	851	6	11	11
Other Revenues	2,462	1,132	2,148	1,750	1,600	1,417	1,109	566
Gross Revenues	20,312	11,990	23,983	27,394	24,996	22,860	21,796	23,853
Operating Expenses:								
Maintenance of Way & Structures	2,849	1,605	4,650	5,130	4,381	3,982	4,147	4,472
Maintenance of Equipment	3,951	1,966	4,353	4,687	4,445	4,332	4,104	4,814
Transportation Expenses	7,346	4,375	8,550	9,789	9,687	8,557	7,940	8,311
Other Operating Expenses	922	558	1,032	1,584	1,728	1,722	1,631	1,981
Total Operating Expenses	15,067	8,505	18,584	21,190	20,240	18,593	17,821	19,578
Operating Ratio	74.18%	70.93%	77.49%	77.36%	80.98%	81.33%	81.76%	82.08%
Net Operating Revenue	5,245	3,485	5,399	6,203	4,755	4,267	3,975	4,274
Taxes and Rents:								
Federal Income Taxes	(1,128	1	1,185	1,113	319	Cr(205)	Cr(120)	-
Payroll Taxes	(	-	679	888	868	965	1,677	417
Other Railway Taxes	(	797	889	907	981	856	-	-
Equipment & Joint Facility Rents	436	507	308	689	722	1,005	864	909
Other	1	-	-	-	-	-	-	-
Total Taxes and Rents	1,565	1,304	3,060	3,597	2,891	2,620	2,420	2,561
Net Railway Operating Income	3,680	2,181	2,340	2,606	1,865	1,646	1,555	1,714
Other Income	249	475	158	191	338	443	504	417
Gross Income	3,929	2,656	2,498	2,797	2,202	2,089	2,058	2,131
Miscellaneous Income Deductions	65	19	13	21	36	97	56	107
Income Available for Fixed Charges	3,864	2,637	2,484	2,776	2,166	1,992	2,002	2,023
Fixed Charges:								
Rents for Leased Roads	804	657	151	-	-	-	-	-
Interest	1,314	1,378	1,040	1,373	1,315	1,188	1,154	1,459
Other	-	29	27	36	32	30	-	37
Total Fixed Charges	2,118	2,064	1,217	1,409	1,347	1,218	1,154	1,496
Income After Fixed Charges	1,746	573	1,267	1,367	819	774	848	527
Contingent Interest	-	-	-	-	65	225	219	204
Net Income	1,746	573	1,267	1,367	754	549	629	323

SOURCE: Ibid.

Exhibit A-22

NEW YORK, NEW HAVEN & HARTFORD RAILROAD COMPANY

COMPARATIVE INCOME STATEMENTS
(000)

	1929	1939	1950	1956	1958	1961	1963	1967
Operating Revenues:								
Freight Revenue	$ 77,914	$ 47,526	$ 88,739	$ 91,715	$ 78,735	$ 67,254	$ 63,541	$ 62,105
Passenger Revenue	46,842	27,382	46,681	51,518	50,595	42,516	41,137	36,484
Other Revenues	17,702	8,511	15,345	19,217	20,221	17,433	18,109	21,517
Gross Revenues	142,459	83,418	150,765	162,450	149,551	127,202	122,788	120,105
Operating Expenses:								
Maintenance of Way & Structures	20,017	11,022	20,959	19,363	17,891	18,986	16,125	17,337
Maintenance of Equipment	23,382	13,737	22,387	25,285	22,811	24,982	21,592	24,455
Transportation Expenses	43,310	31,011	61,816	73,418	71,414	65,440	61,201	62,786
Other Operating Expenses	7,409	5,689	9,913	13,747	13,319	13,047	11,549	11,077
Total Operating Expenses	94,119	61,459	115,076	131,814	125,435	122,456	110,466	115,655
Operating Ratio	66.07%	73.68%	76.33%	81.14%	83.87%	96.27%	89.97%	96.30%
Net Operating Revenue	48,340	21,959	35,689	30,637	24,116	4,746	12,321	4,450
Taxes and Rents:								
Federal Income Taxes	(8,067	111	4,805	193	395	37	Cr.(130)	190
Payroll Taxes	(	-	4,606	5,326	5,058	5,967	5,706	7,449
Other Railway Taxes	(	6,081	5,573	6,376	6,303	2,267	2,822	2,601
Equipment & Joint Facility Rents	6,608	7,304	9,803	16,206	16,215	16,052	14,013	14,398
Other	34	-	-	-	-	-	-	-
Total Taxes and Rents	14,709	13,496	24,789	28,101	27,971	24,324	22,411	24,639
Net Railway Operating Income	33,631	8,463	10,903	2,536	d(3,856)	d(19,577)	d(10,090)	d(20,179)
Other Income	7,454	2,791	5,969	7,756	9,685	8,673	7,594	10,537
Gross Income	41,086	11,254	16,871	10,292	5,829	d(10,904)	d(2,496)	d(9,642)
Miscellaneous Income Deductions	558	647	292	765	781	1,048	2,388	4,078
Income Available for Fixed Charges	40,528	10,608	16,579	9,527	5,048	d(11,952)	d(4,884)	d(13,720)
Fixed Charges:								
Rent for Leased Roads	4,891	788	799	801	801	800	801	763
Interest	12,966	12,734	5,022	6,036	6,057	6,733	6,533	4,982
Other	374	-	65	54	93	64	46	49
Total Fixed Charges	18,231	13,522	5,886	6,891	6,951	7,598	7,380	5,793
Income After Fixed Charges	22,296	d(2,914)	10,693	2,636	d(1,903)	d(19,550)	d(12,264)	d(19,514)
Contingent Charges	-	-	3,225	2,374	2,374	-	-	-
Net Income	22,296	d(2,914)	7,467	262	d(4,277)	d(19,550)	d(12,264)	d(19,514)

SOURCE: Ibid.

Exhibit A-22

Exhibit A-23

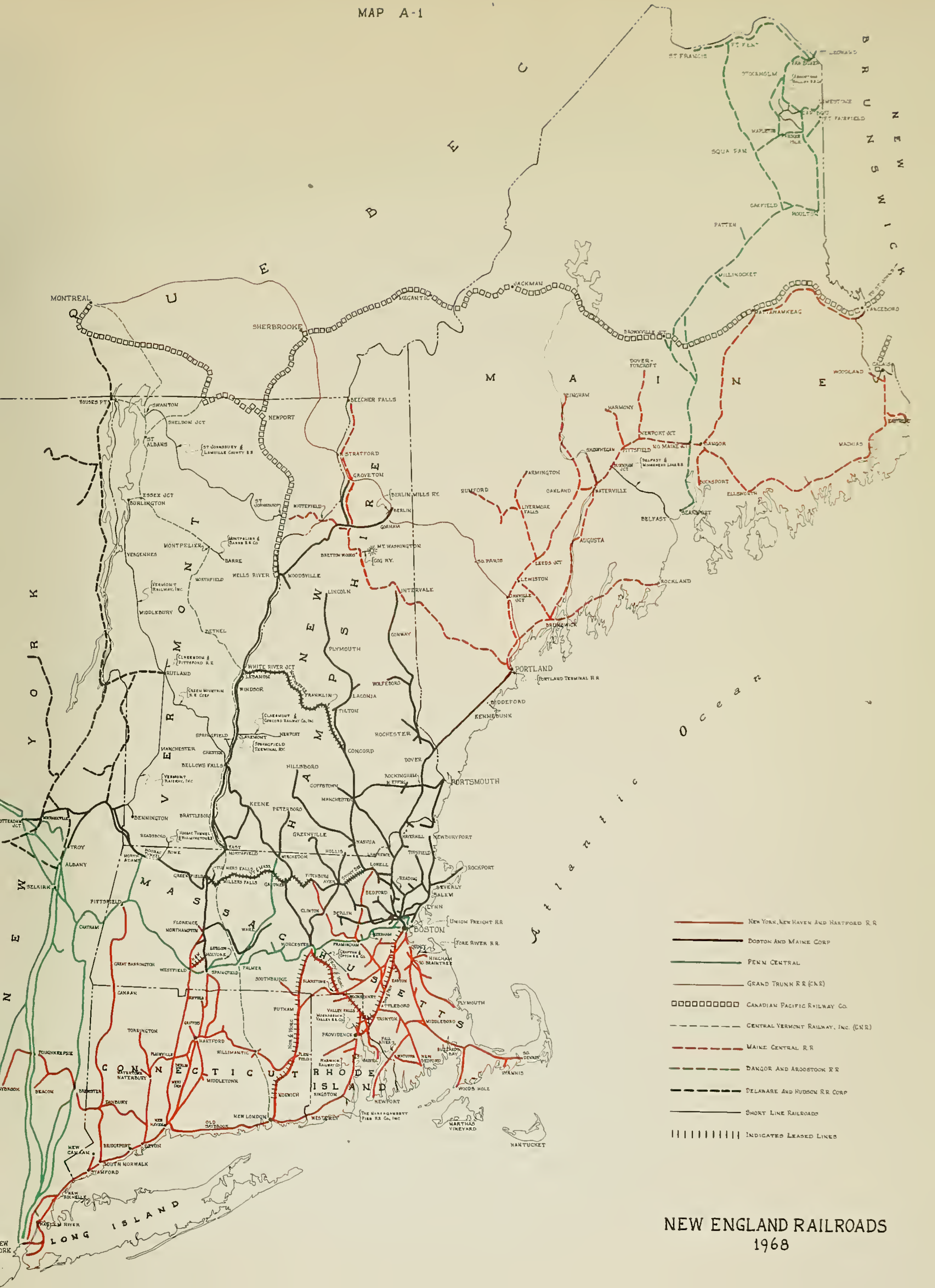
RUTLAND RAILWAY CORPORATION

COMPARATIVE INCOME STATEMENTS
(000)

	1929	1939	1950	1956	1958	1961
Operating Revenues:						
Freight Revenue	$ 3,531	$ 2,335	$ 4,467	$ 4,817	$ 4,334	$ 2,725
Passenger Revenue	1,025	351	360	-	-	-
Other Revenue	1,721	771	815	385	302	35
Gross Revenues	6,277	3,457	5,641	5,202	4,636	2,760
Operating Expenses:						
Maintenance of Way & Structures	1,164	429	865	1,030	885	619
Maintenance of Equipment	1,185	660	1,001	613	681	580
Transportation Expenses	2,330	1,716	3,057	1,893	1,872	1,129
Other Operating Expenses	355	248	390	702	706	537
Total Operating Expenses	5,036	3,054	5,312	4,238	4,145	2,865
Operating Ratio	80.23%	88.33%	94.17%	81.48%	89.41%	103.82%
Net Operating Revenue	1,241	403	329	963	491	d(106)
Taxes and Rents:						
Payroll Taxes	(338	(240	214	189	190	149
Other Railway Taxes	(	(	140	130	138	127
Equipment & Joint Facility Rents	Cr(94)	28	247	221	52	Cr(57)
Total Taxes and Rents	244	268	602	541	381	219
Net Railway Operating Income	997	135	d(272)	422	110	d(324)
Other Income	131	56	98	76	105	100
Gross Income	1,128	192	d(175)	498	215	d(224)
Miscellaneous Income Deductions	11	6	4	9	6	5
Income Available for Fixed Charges	1,117	185	d(179)	490	209	d(229)
Fixed Charges:						
Rents for Leased Roads	19	15	15	-	-	-
Interest	416	392	322	37	54	17
Total Fixed Charges	435	407	337	37	54	17
Net Income	682	d(221)	d(516)	453	155	d(246)

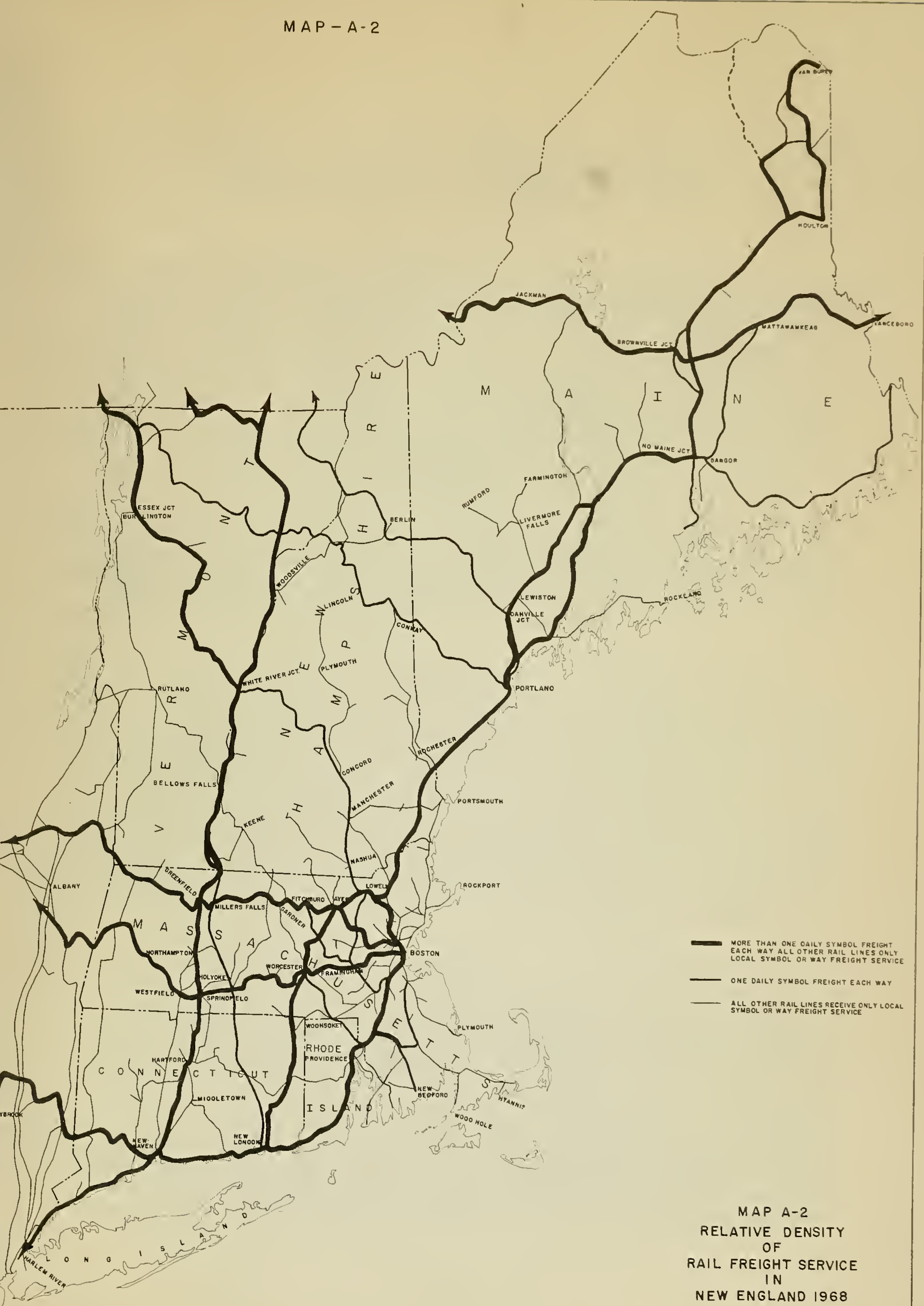
SOURCE: Ibid.

MAP A-1



NEW ENGLAND RAILROADS
1968

MAP – A-2



MAP A-2
RELATIVE DENSITY
OF
RAIL FREIGHT SERVICE
IN
NEW ENGLAND 1968

SOURCE SARC

Appendix B

An Investigation into a Specific Plan for Ultra-High-Speed Rail Service Between Boston and New York

One of the findings of this report is that an ultra-high-speed rail service between Boston and New York is the most promising method of alleviating a pressing transportation problem of the region. The problem is intermodal, arising from the already serious and increasing congestion of highways and airways. The solution involves making use of the outstanding characteristic of rail transportation, namely high capacity. If rail speed can be sufficiently raised to permit a schedule attractive to air passengers, and fares kept low enough to attract highway passengers, the problem will be materially alleviated. Congestion in the other modes will be lessened, leaving them free to develop their capacities in meeting other transport problems. The airways are needed for further development of longer-distance markets, where their speed capabilities are much more effective. The highways are needed for the development of shorter and more dispersed markets, where the automobile's flexibility is most effective.

Unless the rail solution can be developed, expenditures measured in billions of dollars must be faced for increasing airway and highway capacity. Even beyond such cost, a serious question exists as to the social acceptance of the voracious use of land and other such destructive side effects as noise and air pollution which might well result. For these reasons it is imperative that a careful examination of the possibilities of immediate establishment of improved rail service be undertaken. Time and budget restraints preclude a finished study here, but the investigation which follows strongly indicates that a viable service may be established by an upgrading of the existing line more modest than that which other proposals have suggested.

MARKET

In the first full post-war year of 1946, the railroad carried over three million passengers between Boston and New York. The total market has undoubtedly grown since, but because of lack of highway travel data it is not susceptible of precise measurement. The current common carrier annual volume is approximately two million air and half a million each rail and bus, or a total of three million. Automobile travel is presumed to be substantially higher than the common carrier volume. (In general, auto volume exceeds that of common carriers by nine to one.) The ultra-high-speed rail market

might be expected to include all present rail and bus volume, plus half that of air (based on experience in other countries), a total of about two million, leaving one million to come from the highway merely to equal the volume of twenty-two years ago.

Another approach to a market estimate is to start with 1960 rail volume as reported in Systems Analysis and Research Corporation's study of demand in the Northeast Corridor,* increased by some 50% to allow for the difference between true O&D and total travel, and roughly apply the index of cross-elasticity found in that report for sensitivity of rail travel volume to increase in rail speed. This would produce over three million passengers without making allowance for the effect of reduced fare. Since a fare of $8, below the current bus fare, is postulated, it is apparently safe to predict an annual market of three million passengers at the outset.

The market will undoubtedly grow in the future, and a 50% growth in ten years appears reasonable in view of the forecasts made for travel increase in general. Thus an annual volume of 4.5 million passengers after a decade of service appears readily attainable.

POSTULATES

It is assumed that nothing slower than a two-and-one-half-hour schedule between South Station, Boston, and Grand Central Terminal, New York, will suffice to provide a service which will attract enough passengers from the highways and airways to provide the necessary relief. It is further assumed, for the same purpose and to tap substantial markets, that stops must be made at Back Bay,† Route 128, Providence, New Haven and New Rochelle. (New Rochelle is included to provide ready interchange with Westchester County highways as Route 128 station does with Massachusetts highways.)

Minimum frequency postulated is ten trains per day, with future growth to fifteen trains, representing hourly service. Electric operation with equipment similar to the Metroliners soon to operate between New York and Washington is suggested, but with the new suspension device incorporated in the Turbo-train (the jet-powered train to be tested between Boston and

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*<u>op. cit</u>.

†The Back Bay stop may be eliminated soon by route changes resulting from turning portions of the line over to rapid transit.

New York) for greater speed around curves. This selection of equipment is not essential. If decision is made to operate the Turbotrain and eliminate electrification, it will not negate the results.

Since the most severe curves of the existing line are largely concentrated between Westerly, Rhode Island, and the Connecticut River Bridge near Old Saybrook, Connecticut, a relocation of that portion of the line only (about thirty-six miles) was postulated and track charts of the remainder of the line examined to determine the highest practicable speed with 150 mph as a limit. On this basis an educated guess was made of the line improvements necessary to obtain the required two-and-one-half-hour schedule. The original main line between East Junction and Providence via East Providence was used rather than the present main line through Pawtucket because of the superior alignment of the East Providence line.

Attention is called to the expected changes in routing of freight, reported in Chapter II, which will have the effect of removing most of the freight service from the Shore Line.

LINE IMPROVEMENTS

The foregoing review resulted in consideration of complete realignment between Westerly and Saybrook and between East Haven and New Haven, together with straightening of some five curves between Providence and New Haven. No realignment was contemplated between New Haven and New York because of high land values, but speeds were confined to those dictated by existing curvature. No improvements were postulated on the Penn Central's line from Woodlawn to Grand Central Terminal. Elimination of all grade crossings and complete fencing was included. New track with welded rail and centralized control of the whole operation from one point as well as automatic train control was assumed. Without further realignment, it appears feasible to accomplish a two-hour, forty-minute schedule with conventional trucks, or two hours and twenty-four minutes with the Turbotrain's suspension system. This is based on the assumption that the Turbotrain's suspension permits 30% higher speeds through curves. If this is not proven by experience, further realignment is necessary, but it appears likely that a two-and-one-half-hour schedule is within reach. The cost of these improvements, together with electrification and new track is estimated at $300 million, or $200 million without electrification.

EQUIPMENT AND SCHEDULE

Ten-car trains of two parlor cars and eight coaches each are set up, with each set making two round trips per day on

approximately the following schedule. One full train of ten cars is held as a spare.

	1*	2	3	4	5	1	2	3	4	5
	AM	AM	AM	AM	PM	PM	PM	PM	PM	PM
Boston	6:50	8:00	9:30	11:30	1:00	2:00	3:30	5:00	6:15	8:30
Back Bay	6:53	8:03	9:33	11:33	1:03	2:03	3:33	5:03	6:18	8:33
Route 128	7:01	8:11	9:41	11:41	1:11	2:11	3:41	5:11	6:26	8:41
Providence	7:19	8:29	9:59	11:59	1:29	2:29	3:59	5:29	6:44	8:59
New Haven	8:20	9:30	11:00	1:00	2:30	3:30	5:00	6:30	7:45	10:00
New Rochelle	8:56	10:06	11:36	1:36	3:06	4:06	5:36	7:06	8:21	10:36
New York	9:20	10:30	12:00	2:00	3:30	4:30	6:00	7:30	8:45	11:00
	AM	AM	M	PM	PM	PM	PM	PM	PM	PM

	4*	5	1	2	3	4	5	1	2	3
	AM	AM	AM	M	PM	PM	PM	PM	PM	PM
New York	7:00	8:00	10:00	12:00	1:00	3:00	5:00	6:00	7:15	8:30
New Rochelle	7:24	8:24	10:24	12:24	1:24	3:24	5:24	6:24	7:39	8:54
New Haven	8:01	9:01	11:01	1:01	2:01	4:01	6:01	7:01	8:16	9:31
Providence	9:00	10:00	12:00	2:00	3:00	5:00	7:00	8:00	9:15	10:30
Route 128	9:18	10:18	12:18	2:18	3:18	5:18	7:18	8:18	9:33	10:48
Back Bay	9:26	10:26	12:26	2:26	3:26	5:26	7:26	8:26	9:41	10:56
Boston	9:30	10:30	12:30	2:30	3:30	5:30	7:30	8:30	9:45	11:00
	AM	AM	PM	PM	PM	PM	PM	PM	PM	PM

* Numbers identify equipment set assigned.

OPERATING COST

Maintenance of way cost is estimated at. . $2.5 million

Maintenance of equipment is difficult to estimate in the absence of experience, but an allowance has been made based on substantial increase over current electric MU car annual cost. Including shop expense and supervision this comes to . . . . $3.0 million

Transportation costs are estimated as follows: Crew cost can be held to $1.0 million if labor will assent to an arrangement which substantially increases wages by taking advantage of the opportunity for improved productivity.

Power is estimated at $2.0 million.

Other transportation, including dispatching, station forces and supervision comes to $1.4 million.

Total transportation . . . . $4.4 million

Other costs including station costs (allowing for upgrading of stations), property taxes, insurance and claims are estimated at	$ 2.9 million
Marketing, sales, advertising, and general office costs come to	$ 2.2 million
Equipment amortization for sixty cars at $440,000 each, thirty-year life, 7% interest, with allowance for insurance, comes to	$ 1.9 million
Total operating expenses	$16.9 million

NOTE: Payroll taxes and fringe benefits are included in the appropriate item. No allowance for attendants is made on the assumption that their cost will be substantially defrayed by beverage and food revenue.

After ten years, with 50% growth, fifteen trips will be operated with only seven trains plus one spare. This will increase operating expenses to	$20.6 million

REVENUE

A very low fare of $8 for coach passengers is postulated to test fully the potential exploitation of a mass market by a high-capacity mode. Parlor car fare is set at $15 to exploit the quality travel market.

Three million passengers at $8.	$24.0 million
500,000 parlor car passengers at $7 extra	3.5
One million Providence-New York at $7 . .	7.0
Boston-Providence, Boston-New Haven and New Haven-New York	3.0
Station and train concessions	0.5
Total revenue estimate	$38.0 million
Net income before fixed charges	$21.1 million
After ten years revenue will be $57 million and net income before fixed chgs.	$36.4 million

Constant dollars are used in both expense and revenue figures on the assumption that both will be affected by inflation.

FINANCING

Carrying charges for equipment and station improvements are included in operating costs. There remain the interest and sinking fund commitments to repay the original construction and necessary working capital. The net income and growth rates indicated can support the necessary financing, if this is done on the basis of a government-guaranteed loan. Although marginal at the outset, the enterprise appears to be self-supporting, and at the above growth rate to be capable of earning a good profit. The Tokaido line in Japan is demonstrating an earning power that will pay off its total investment (much higher than the investment required here) in ten years or less. No such claim is made for this project, because the forecast volume is less than one-tenth of that which the Tokaido line is carrying.

There are other benefits. High-speed container service can be operated at night so as to provide overnight service from Boston and Providence to Philadelphia and Baltimore. If this were a highway proposal, a benefit of about one dollar per hour for saving in passenger's time would be included, amounting to some $5 million per year. Saving the billions otherwise necessary for highway and airway improvements would alone cover the entire cost of the rail service. Noise and air pollution will be decreased.

Bus connections properly coordinated with the new rail service would effectively extend coverage to most of New England. Both Providence and Route 128 offer interchange points where easy and convenient transfer could made to buses serving Massachusetts and southern New Hampshire points. If a bus terminal is located at South Station, as has been proposed, transfer at that point to buses serving Maine and parts of New Hampshire would be easily arranged.

Hartford and Springfield will presumably support their own train service, connecting at New Haven. Vermont and western New Hampshire would be well served by bus connections from Springfield.

These bus connections not only extend the service, but would more than absorb any vehicles and operators displaced from Boston-New York service.

Probably the greatest benefit will be evidenced by a large increase in total travel. The demand for passenger travel is shown by experience to be extremely volatile, and there is no doubt that the opportunity to go to New York in two and one-half hours at $8 will induce new travel not now going by any mode.

A most interesting fringe benefit will be the opportunity to locate a new jetport midway on the line, referred to in Chapters II and IV. Such an international airport, readily accessible to transatlantic SST's (which would be over water before reaching supersonic speed) would provide relief both to Boston and New York airports and serve all of southern New England.

The possibility of solving pressing problems by means of a desirable improvement which shows promise of paying for itself should not be ignored. The Commission should immediately order a careful study of this proposal. Cost of such a study should not exceed $50,000, and would, if the results of this review are borne out, form the basis of a request for government guarantee of a loan to finance the improvement.

Appendix C

Intermodal Split of Freight Traffic Originating in New England

The 1963 Census of Transportation commodity survey provides insight into the principal commodities, modal split, and geographic distribution of New England manufactured products. The survey reports segregate the data for the 25 principal industrial production areas in the United States. In New England there are two production areas, Production Area 1, which includes the SMSA's* of Boston, Worcester, Providence, Pawtucket, Warwick, Brockton, Lawrence, Haverhill, and Lowell; and Production Area 2 consisting of the SMSA's of Hartford, New Britain, Meriden, Waterbury, New Haven, Bridgeport, Norwalk, Stamford, Springfield, Chicopee, and Holyoke. The data collected in this survey is based upon information gathered by the U.S. Bureau of the Census at the plant or production center level.

PRODUCTION AREA 1

A review of Production Area 1 information reveals that the most important commodity group measured by tons of shipment is food and kindred products. This grouping represents about 25% of the total tons shipped. Significantly, almost 60% of this tonnage is transported by private truck. Common carrier truckers receive only about 37% of the tonnage and the railroads receive but 3%. The reason for the heavy dependence on private carriage is clear because the bulk of the transportation is for short distances. Close to 30% of all the shipments which originate in the production area also terminate within the same area. The other prime areas to which the products in this group are shipped include Production Area 2, with 4.2% of the shipments, and the Syracuse, Utica, Rome, Albany, Schenectady, Troy area with 4.3% of the shipments. All other production areas in the United States receive significantly less of the shipments than do these three principal areas. Traditionally, private carriage has flourished for the short haul and in the case of food and kindred products private carriage is further stimulated because most of the shipments are exempt from regulation, allowing the small unregulated trucker (categorized as private in the survey) to be highly price competitive with the regulated common carrier.

The second largest group of shipments from Production Area 1 is in the category of primary metal products. This group accounts for approximately 12% of the total tons

*SMSA - Standard Metropolitan Statistical Area

shipped. The modal split for the shipment of these products is completely different from that for food and kindred products. Private trucks carry only 5.3% of the products whereas common carrier truckers haul 47.1% of the total tons shipped. The distribution of these products is widely dispersed, with only 10% of the total shipments terminating in Production Area 1 and 7% in Production Area 2. New York received 10% and a significantly large share, 16-1/2%, goes to the Chicago - Gary, Indiana area.

The third largest commodity group shipped is chemicals and allied products, accounting for approximately 1% of the total tons originated from the Greater Boston area. This product group is primarily transported by truck with 22.5% going on private trucks and 66.7% going to common carrier truckers. The rails receive 8.8% of the total traffic. The remaining product groups account for substantially less tonnage shipped from the area than do the three specifically mentioned.

A review of the modal split of some of the remaining product groups reveals interesting diversions from the averages for the region. Of significance is the transportation of footwear from New England. For this commodity group only 0.2% is shipped by private truck, 3.1% by rail, with the majority 89.8% going by common carrier truck. Air cargo receives 0.2% of this traffic. The distribution of footwear products is nation-wide with a significant amount destined to the West Coast. The Los Angeles area alone receives 9% of the total shipments from Production Area 1 as compared to 8.6% of the total shipments terminating in New England.

Another product group with a significant export from Production Area 1 is steel works and rolling mill products with 40% of the output going to the New York/New Jersey area and 9% to the Detroit area. The Boston region also produces a significant amount of metal machinery and equipment destined to the Pittsburgh area (42.8% of the total production). This traffic moves primarily by rail (50% of production), with common carrier trucks receiving 26% of the total.

Air freight carries significant shares of the market of several products, notably electronic components or accessories (18.3%), miscellaneous electronic components and accessories (27.5%), jewelry, silverware, and plated-ware (6.8%), electronic tubes (6.5%), indicating recording and measuring instruments (4.9%), and electrical transmission and distribution equipment (2.9%). There are numerous other product groups where air cargo has more than 1% of the shipments from the region.

PRODUCTION AREA 2

Of the product groups identified in Production Area 2 (consisting of Hartford, New Britain, Meriden, Waterbury, New Haven, Bridgeport, Norwalk, and Stamford, Connecticut, and Springfield, Chicopee, and Holyoke, Massachusetts), chemical and allied products account for 25% of the total tons of shipment. Of this tonnage, the rails receive 33.7%, common motor carriers 45.4%, and private trucks 18.6%. The next largest group is primary metal products with 17% of the total volume. These products are primarily handled by common carrier truckers (55.4%), and private truckers (22.6%), with railroads receiving only 17.6% of the shipments. Ranking third with about 14% of the total tonnage is the product group of plastic materials, plasticizers, synthetic resins, rubbers and fibers. In this group private trucking accounts for only 3.2% while common carrier truckers receive 63.3% and the railroads 33.5%.

COMMON CARRIER/PRIVATE TRUCK MODAL SPLIT

There is a significant difference in the use of private truck transportation in Production Area 2 as compared with Production Area 1. The reason for the greater utilization of private trucking in Production Area 1 becomes apparent when a comparison is made between the average length of haul by each of the modes of transportation (Exhibit C-1) with the same data for the Hartford production area. In both production areas the average length of haul for private trucking is approximately the same; whereas in Production Area 2 as compared to Production Area 1, the average length of haul for rail is substantially greater and for motor carrier it is about 25% greater, with approximately 30% greater length of haul by all means of transportation. Traditionally, private truck has been used for short haul movements (See Exhibit C-2) where better utilization can be obtained and better opportunities for finding cargo for the return haul to the plant. The characteristics of length of haul of Production Area 1 products to their markets make for advantageous use of private trucking.

Another reason for the great predominance of private trucking from Production Area 1 is the high incidence of the shipment of food and kindred products which is traditionally related with private carriage and unregulated trucking.

It should be remembered that all of the foregoing data relates to shipments originating in New England. Corresponding data for shipments received in New England is not available, but it can be inferred from general knowledge of relative volumes that the modal split is quite different.

Exhibit C-1

DISTRIBUTION OF AVERAGE LENGTH OF HAUL
BY MEANS OF TRANSPORTATION 1963

	All Means	Rail	Motor Carrier	Private Truck	Air	Water	Other
United States							
All commodities	439	494	250	126	875	773	642
All commodities except petroleum & coal products	364	503	266	129	968	719	657
Production Area 1 1/	304	745	298	120	1139	191	987
Production Area 2 1/	471	877	407	108	1078	645	735

Note:
Production Area 1 consists of the following SMSA's: Boston, Worcester, Providence-Pawtucket-Warwick, Brockton, Lawrence-Haverhill, Lowell
Production Area 2 consists of the following SMSA's: Hartford, New Britain, Meriden, Waterbury, New Haven, Bridgeport, Norwalk, Stamford, Springfield-Chicopee-Holyoke

1/ All commodities (petroleum and coal product content small and insignificant).

SOURCE: 1963 Census of Transportation, Production Area Series

Exhibit C-1

Exhibit C-2

COMPARISON OF AVERAGE HAULS PER TON
BETWEEN U.S. RAILROADS AS A SYSTEM
AND AS INDIVIDUAL CARRIERS AND CLASS I MOTOR CARRIERS
(Selected Years)

Year	Railroads		Class I Motor Carriers	
	U.S. As a System	Carrier	Common	Contract
1949	412	218	238	129
1959	448	239	273	183
1963	464	251	267	142
1964	466	252	256	136
1965	477	257	N.A.	N.A.
1966	483	262	N.A.	N.A.
1966				
B&M		182		
NH		157		
MEC		115		

SOURCE: ICC Transport Statistics, op. cit.; B&M, NH, MEC, ICC Form A Annual Reports, op. cit.

The relative importance of rail movement to truck, for example, is much greater inbound than outbound. Truck tonnage is reasonably well balanced directionally, but inbound loaded freight cars outnumber outbound by some 3 or 4 to 1. Since they are also more heavily loaded, the imbalance in tonnage is even greater, probably at least 6 to 1.

Exhibit C-3 compares the modal split of New England's freight with that of other regions.

INTERMODAL COST COMPARISON

Direct comparison of the cost of handling freight by various modes of transportation has many problems and any such direct comparison can be misleading unless one fully realizes the rules under which the comparison is made. In Exhibit C-4 is shown a comparison of the fully distributed cost in cents per 100 pounds, for shipments moving in carload, trailerload, and planeload lots for various distances and weight brackets. This data shows that at all distances for shipments weighing 30 tons or more, rail has a cost advantage over truck and air. It must be remembered however, that the majority of shipments for distances of 50 miles or less are in less than carload (LCL) and less than truck load (LTL) amounts which gives truck a cost advantage. However, it is difficult to show such a comparison between rail and truck for such shipments because of the inability of generalizations or averages to reflect the true cost data for a particular commodity.

While a comparison of fully distributed costs gives some measure of the relative economics of using different modes of transportation; costs themselves do not necessarily reflect the price paid by the shipper. In most cases, freight rates are not lower than fully distributed costs, but even this generalization can be misleading because it is well recognized that it is better for a transportation company to price its product at the marginal or incremental cost level than at fully distributed cost if this is the only way by which that mode can attract the traffic. In this circumstance, rail has a substantial advantage over truck because a much lower proportion of total railroad costs are variable as compared to the fixed/variable cost relationship in trucking operations. The majority of rates, however, are based on the value of service rate-making concept which is essentially demand pricing. It is, moreover, difficult to conclude from a cost comparison such as is shown in Exhibit C-4, which mode will be chosen by shippers because other factors such as service enter into the decision-making process of the individual traffic manager.

There are two points to be kept in mind by government in connection with these cost comparisons. One is the obvious one that so far as low cost is the objective of governmental transportation promotion policy, there are parts of the transportation job in which different modes operate at the lowest cost. In very general terms, highway carriers excel in this respect in the carriage of small shipments, or larger shipments for very short distances. Rail carriers excel for large shipments, especially as distance increases. The other point of importance is that rates paid by shippers are clearly influenced by more than just the cost factor. Since some freight clearly exhibits an ability to bear charges well above costs, the promotion or subsidy of transportation to carry such freight cannot be justified on the basis of encouraging such movement.

Exhibit C-3

COMPARISON OF NEW ENGLAND'S FREIGHT MODAL SPLIT WITH OTHER AREAS
1963

Origin Area of Shipments	Total Tons (Millions)	Percent Tonnage Distribution by Means of Transport: Rail	Motor Carrier	Private Truck	Air	Water	Other
United States							
All commodities	1437.6	32.6	25.1	16.9	*	24.4	1.0
All commodities except petroleum and coal products	1037.3	42.7	31.1	20.6	*	4.9	0.7
New England 1/							
Production Area 1 2/	8.9	11.7	50.9	27.8	0.1	7.8	1.7
Production Area 2 3/	4.2	22.4	53.5	18.7	0.3	2.3	2.8
New York (excluding petroleum and coal products)							
Production Area 3 4/	9.8	9.1	49.2	37.3	0.2	1.2	3.0
Production Area 4 5/	17.3	20.3	61.7	13.2	0.1	2.9	1.8
Philadelphia							
Production Area 5 6/	20.5	31.1	47.1	18.1	0.1	2.3	1.3
Baltimore-Middle Pennsylvania							
Production Areas 6,7 and 8 7/	26.7	37.4	48.5	9.9	*	3.5	0.7

*Notes on following page

Notes:

* Less than 0.1 percent

1/ Includes all commodities, petroleum and coal products not excluded because they are a very small part of the total.

2/ Production Area 1 consists of the following SMSA's: Boston, Worcester, Providence-Pawtucket-Warwick, Brockton, Lawrence-Haverhill, Lowell.

3/ Production Area 2 consists of the following SMSA's: Hartford, New Britain, Meriden, Waterbury, New Haven, Bridgeport, Norwalk, Stamford, Springfield-Chicopee-Holyoke.

4/ Production Area 3 consists of New York City SMSA.

5/ Production Area 4 consists of the following SMSA's: Newark, Jersey City, Patterson-Clifton-Passaic, and Middlesex and Somerset counties in New Jersey.

6/ Production Area 5 consists of the following SMSA's: Philadelphia, Wilmington, Trenton.

7/ Production Area 6: Baltimore. Area 7: Allentown-Bethlehem-Easton, Reading. Area 8: Harrisburg, Lancaster, York.

Source: 1963 Census of Transportation, Commodity Transportation Survey, Production Area Series, U.S. Department of Commerce, Bureau of the Census, Washington, D.C.

Exhibit C-4

RAIL, TRUCK AND AIR COST COMPARISONS
FOR NEW ENGLAND 1/
CARLOAD, TRUCKLOAD OR PLANELOAD SHIPMENTS

Fully Distributed Costs
in cents
per 100 pounds

Distance in Miles	Rail Weight of Carload 30 tons	40tons	50tons	Truck Weight of Truckload 20tons 2/	30tons 3/	40tons 4/	AIR Weight of Plane-load 30tons 5/
50	23.2	19.1	16.7	22.9	51.0	45.8	--
100	28.3	23.6	20.8	31.0	67.3	62.0	--
300	49.1	41.6	37.1	70.1	145.1	140.2	--
500	69.8	59.6	53.5	110.2	225.7	220.4	--
1000	121.7	104.5	94.3	210.3	426.4	420.6	864.0

1/ Costs represent, with the exception of air, the experience in 1965 of the New England Railroads and of New England trucking companies in 1966.

2/ Normal maximum truckload.

3/ Cost of operating two trucks each carrying 30,000 pounds.

4/ Cost of operating two trucks.

5/ Costs based on experience of AH, VA and FT from CAB Form 242. Prime plane in service B-707-320C which has a 45 ton capacity for more than 1,000 miles. At average density of air cargo of 8lbs./cu.ft. the plane has a capacity of 30 tons.

Sources: <u>Rail Carload Unit Costs by Territories</u> for the Year 1965, Interstate Commerce Commission, Statement No.7-67, Washington, D.C., May 1967.

<u>Cost of Transporting Freight by Class I and Class II Motor Carriers of General Commodities by Regions or Territories</u> for the Year 1966, Interstate Commerce Commission, Statement No.8-67, Washington, D.C., September 1967.

<u>Air-Truck Coordination and Competition</u>, Interstate Commerce Commission, Bureau of Economics, Statement No.67-1, Washington, D.C., February 1967.

Appendix D
New England Freight Rates

RAIL

Comparison of freight rates is very complex. Rate structures are complex to begin with, and to make it more difficult, they are influenced in their application in a variety of ways. To some extent rates are influenced by a "value-of-service" concept with the result that they are higher for commodities of higher value. Their application is further complicated by the existence of a large number of special commodity rates. Regulatory influences designed to protect market competition are also present. In the early days, rate patterns were influenced by rail competition. In general, all these influences are so disparate and random that comparisons of rate structures themselves are meaningless or misleading.

Fortunately, a careful analysis has been made by Dr. James R. Nelson as part of his "Railroad Merger and the Economy of New England."* His findings are that New England manufacturers and users of manufacturers' products "have at the very least not suffered relative to the rest of the country, with respect to rail rates."

With respect to other classes of commodities, New England is in a generally favorable position except for coal. New England all-rail coal rates appear high in comparison with the rest of the country, apparently because of historic emphasis on water movement as well as the fact that coal moves over several railroads between the mines and New England. As Chapter II indicates, this is best attacked by (1) furthering the railroad merger movement, specifically by supporting the N&W-C&O merger, and (2) by encouraging the greater use of unit-train coal rates.

"Cost-Based Freight Rates," a study performed by SARC for the U.S. Department of Commerce, showed that freight rates for both rail and motor common carrier have tended to be based more on value than on cost. This has the effect of making New England freight rates seem high merely because New England's manufactures tend to consist of high-valued commodities. Another historic influence on freight rates has been a tendency to dampen the geographical effect of location in order to heighten market competition, and this has tended to keep New England rates down.

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*Boston, New England Economic Research Foundation, 1966.

The net effect is well described in Dr. Nelson's study, excerpts from which follow:

2. Competition: the Impact of Quality and Quantity

One of the more inexplicable features of nineteenth century American railroad development arose from certain of the things it failed to accomplish.

First for the successes.

The extent of price competition in the early days of railroading was almost unparalleled. Right from the beginning, rail movement of freight was by far the cheapest overland method: with a rate of 6.25¢ per ton-mile between Boston and Worcester as early as 1833, for example, as compared with a rate of 17.5¢ by turnpike. Between 1815-20 and 1860, freight charges on land shipments of bulky products for considerable distances had declined by 95%.[152] The railroad always had an enormous advantage in out-of-pocket costs per ton-mile, and many early railroads had strikingly low operating ratios even when hauling freight at rates much below those charged by other land transport. But a low operating ratio might be combined with low revenues per dollar of investment. Hence, even without competition, sheer self-interest might dictate rate cuts in the hope of gaining enough on the volume to overcome the loss in unit profit. As the radius of economically feasible rail transport extended to greater and greater distances, an industry once supported by local monopoly approximated more and more to an industry growing both in spite of and because of distant competition. Rate cuts forced weaker firms into mergers and forced high-cost routes into subordinate roles. But they also rapidly widened the geographical extent of the market for rail service--especially rail freight service. The fortunate, or the forehanded, were able to command ample capital in spite of their rate cuts, and ample demand for their services because of them. Rate cuts also probably caused, as well as reflected, technical progress. In sharpening the necessity to struggle for survival, they must have caused some railroad managements to struggle harder.

All of this was of treble benefit to New England. As the most remote part of the United States from the most rapidly-developing areas, New England

[152] George Rogers Taylor, The Transportation Revolution, pp. 134-135.

stood to gain relatively the most or hold its losses to relatively the least by successive reductions in the ton-mile cost of maintaining economic contact with the westward flow of population. As the best-situated area in the country for playing off water against land competition, it stood to gain relative to inland areas as long as water competition remained vigorous. And, as the oldest manufacturing area in the country, it stood to gain particularly from a tendency for railroad rate competition to be highly differential in character, with the biggest discounts available for the biggest shippers. Whether the Interstate Commerce Act was originally a Magna Carta for rail shippers and their customers, or simply the instrument for enabling the railroads to achieve and enforce a cartel arrangement which they could not have successfully policed otherwise, the indisputable fact is that the influence of the Interstate Commerce Commission went toward making rail rates less dynamic. The early arrival thus probably got additional protection from the potential new competitor in some other parts of the country. And New England manufacturing firms were the earliest arrivals of all.

Whatever the reasons, New Englanders were almost embarrassingly happy about their interterritorial rail rate position just before and just after World War I. They could not boast about it, because at the same time they had to convince the Interstate Commerce Commission, other railroads, and the American public that New England railroads were high-cost and therefore deserved unusually large divisions of through rates. But the Interstate Commerce Commission was not unaware of the situation:

> The long-distance rates which New England enjoys are generally very favorable to that locality. . . Substantially all New England takes what is known as the Boston rate, which is usually 2 cents per 100 pounds higher than the New York rate. Rates upon the products of New England to markets of consumption in other parts of the country are usually low . . .[153]

The same comment is made seventeen years later, with at least equal force, after the rate adjustments

[153] The New England Investigation, 27 I.C.C. 560 at 575 (1913)

brought about by the New England Divisions case of the early 1920's:

> Because of the abnormally low class rates now in effect between New England and much of trunk-line territory it is inevitable that a general class-rate readjustment will affect those rates more drastically than any others in official territory. By way of illustration, the first-class rate from Bangor to points in the 60 percent group west of Pittsburgh is 90 cents for a distance somewhat in excess of 900 miles. This is probably one of the lowest class rates to be found anywhere in the United States. . .
>
> . . . the class rates between New England and trunk-line territory are relatively lower, on the average, than any other interterritorial or intraterritorial group of rates in official territory. . . .[154]

After this statement from the Interstate Commerce Commission it was finally safe for the 1931 New England Governors' Committee to quote Professor Cunningham of Harvard on the rate position, in the process of crediting it to the local interests of New England railroads:

> '. . . By the efforts of the New England railroads collectively and certainly without any assistance from the trunk lines, the class rates now in effect from all New England, as far east as Bangor, to Chicago, are the same as from New York. The present rates are now to be superseded by a new scale of class rates, prescribed by the Interstate Commerce Commission, in which the factor of distance is given much greater weight. The Commission, however, has tempered the hardship on New England by permitting rates lower to Central Freight Association points than the maximum level on the strictly mileage basis. . .'[155]

Of course, all of this had occurred when New England was not only the manufacturing center of the country, but put special emphasis on just the high unit value

[154] Eastern Class Rate Investigation, 164 I.C.C. 314 at 399 (1930)

[155] Report . . . 1931, p. 212, directly quoting Professor Cunningham

products which best suited the value of service rate system then used by the railroads without fear of truck competition. As both the industrial concentration and the freedom from competition slowly changed, the argument seemed rooted to the previous set of facts. Rates received a great deal more emphasis than service.*

. . .

Table IV-5--Incremental Revenues per Ton-Mile, Selected Commodity Classifications, New England vs. United States and Comparable Hauls, United States

	-----Shipments to New England----			
	Agriculture	Animals	Mines	Forests
To New England-miles	1110	1280	464	877
National average-"	450	881	239	555
Difference - "	660	399	225	322
Incremental revenue per ton-mile	1.12¢	2.89¢	1.16¢	0.80¢
Mileage block data:				
Block nearest to New England-average-miles	1181	1193	469	787
Block nearest to national -average-miles	482	824	314	496
Difference-miles	699	369	155	291
Revenue per ton:				
High mileage	$19.49	$33.88	$4.55	$12.91
Low "	9.59	23.07	3.64	9.92
Difference	$ 9.90	$10.81	$0.91	$ 2.99
Incremental revenue per ton-mile	1.42¢	2.93¢	0.58¢	1.03¢
Recapitulation: Incremental revenue per ton-mile				
New England vs. U.S.	1.12¢	2.89¢	1.16¢	0.80¢
High vs. low U.S. mileage block	1.42	2.93	0.58	1.03

SOURCE: Same as Exhibit IV-8, plus ICC Carload Waybill Statistics, Mileage Block Progressions, 1960

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*Nelson, op. cit., pp. 66-70.

Once these qualifications are added to the figures themselves, it is obvious that New England obtains real bargains relative to the rest of the country with respect to inward movements of agricultural and forest products. Its position on imports of animals and products is about average, considering the length of haul. Its position on minerals appears to be spectacularly above average, even though the ratio of the average New England to the average national distance is almost 2:1.*

. . .

Table IV-22--Manufactures and Miscellaneous--Revenues per Car and per Ton, Certain Comparable Hauls, to and from New England and Nationally, 1960

	To New England			From New England			Comparable National-Mileage Block Data		
	-------Average------			-------Average------			-------Average------		
	Miles Haul	Tons Load	Revenue per Car	Miles Haul	Tons Load	Revenue per Car	Miles Haul	Tons Load	Revenue per Car
Within New England	144	31	$ 111.45	(144)	(31)	($111.45)	145	40	$ 190.80
Middle Atlantic	341	32	266.13	368	24	269.00	291	35	285.18
South Atlantic	785	32	503.85	852	24	505.12	777	27	561.10
East South Central	1178	26	626.15	1216	23	566.08	1170	29	641.28
West South Central	1746	32	842.45	1812	17	823.08	1649	31	915.03
Mountain	2356	38	1091.25	2246	18	988.09	2426	26	1185.83
Pacific	3086	37	1173.53	3068	19	1244.19	3096	26	1247.69

Sources: I.C.C. Carload Waybill Statistics, State-by-State and Mileage Block Progressions, 1960 **

*Ibid., pp. 96-97.

**Ibid., p. 124

It will be noted, first of all, that every single revenue per car for New England is below the comparable national figure. An obvious explanation is the lighter loadings typical of traffic to and especially from New England. But New England rates are clearly lower in three cases of inbound movements (out of a total of seven) which involve average loadings which are heavier than the national average.

Second, the similarity in carload receipts for inbound and outbound New England movements is remarkable. Although outbound cars are typically much less heavily-laden, this does not seem to affect the figures. Two outbound figures are clearly below the inbound figures. In one of the two cases, the outbound weight is at its closest to the inbound weight; in the other case, the weight discrepancy is at its maximum value. Another extreme discrepancy in weights per car, on shipments between New England and the Pacific Coast, shows a higher carload average revenue for the lightly-laden westbound car.

Nor does it seem likely that the favorable New England record is a paradoxical result of generally high rates which drove away business handled elsewhere by rail. If this were the case, then the New England loads should be much heavier, relative to the national average, than they actually are.

The conclusion must be that New England manufacturers and New England users of manufactured products--both businesses and final consumers--have at the very least not suffered, relative to the rest of the country, with respect to rail rates.*

MOTOR

A comparison of New England motor carrier rates is complicated by the fact that New England carriers do not use the National Motor Freight Classification but publish their own classification tariff. The New England classification system places much greater emphasis on density than does the National Motor Freight Classification. The NMFC considers density but places more emphasis on other characteristics, such as susceptibility to damage and pilferage potential. In comparison with other territories, this generally results in New England rates being higher per mile for low density and lower for high density products.

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*Ibid., pp. 124-125.

The New England classification process of assigning different class ratings than other bureaus for similar products results in a number of apparent discrepancies. For example, a comparison of class rates on woolen cloth from Boston to New York and Baltimore indicates that a shipper in Boston could ship to Baltimore for less cost than to New York. The class rates per cwt. are:

	0-500#	5-1500#	15-5000#	5-8000#	8000#up
Boston to New York N.E. class 2	5.48	5.08	4.59	3.58	2.32

	0-1000#	1-2000#	2-5000#	5000# over
Boston to Baltimore M.A. class 100	4.57	4.33	3.77	3.08

However, to obtain a true comparison, commodity rates must also be analyzed. Commodity rates are specific point-to-point rates published by the carriers to attract particular movements and to compensate for special circumstances. Commodity rates on woolen cloth from Boston to New York and Baltimore are:

Boston to New York NE4Q, item 2085	0-12,000# 2.01		
Boston to Baltimore MA25F, item 6440	0-2000# 4.16	2-6000# 3.53	6000# & over 3.17

Thus, the discrepancy caused by different methods of assigning classification ratings is more than offset by publishing commodity rates.

A comparison of class rates on cotton piece goods produces different results:

Boston to New York N.E. class 5	0-2000# 2.37	2-6000# 1.93	6-20,000# 1.50
Boston to Baltimore M.A. class 60	0-2000# 2.97	2-6000# 2.76	6000# & up 2.31

A further comparison of New England rates with other territories is shown in Exhibit D-1. This exhibit shows the New England rates are lower than the neighboring Middle Atlantic territory rates for hauls up to 300 miles, the category in which most New England traffic moves. Efforts are being made by other tariff bureaus to increase ratings on low density traffic. Several proposals are currently under study to establish ratings based on density for light articles. These efforts will eventually be successful and the disparity between New England and other territories on low density products will be reduced.

Exhibit D-1

COMPARISON OF TRUCK RATES 1/ BETWEEN NEW ENGLAND, MIDDLE ATLANTIC AND SOUTHERN RATE TERRITORIES FOR SELECTED COMMODITIES AND MINIMUM CHARGES

Miles	Minimum Charges			Shoes 2/			Stuffed Toys 3/			Printing Paper 4/			Iron & Steel 5/ Hardware		
	N.E.	M.A.	SO.	N.E.	M.A.	SO.	N.E.	M.A.	SO.	N.E.	M.A.	SO.	N.E.	M.A.	SO.
50	400	605	405	175	287	167	399	431	237	147	177	93	147	213	116
100	440	620	415	208	323	205	481	485	293	170	197	115	170	239	144
150	485	620	425	252	343	233	580	515	334	197	208	133	197	253	171
200	505	630	435	279	379	256	657	569	369	215	228	146	215	278	188
300	610	640	460	376	397	312	921	596	453	276	238	185	276	290	228
400	630	650	480	439	427	353	1084	641	515	314	254	208	314	311	256
500	670	650	495	509	445	382	1252	668	558	357	264	225	357	324	277

1/ Minimum charge is shown in cents per 100-lbs and applies per shipment. Other rates shown are class rates in cents per 100-lbs for shipments of 1000#. Rates in effect 4-15-68.

2/ New England class 3; Middle Atlantic and Southern class 100.

3/ New England class 1; Middle Atlantic and Southern class 150.

4/ New England class 5; Middle Atlantic and Southern class 55.

5/ New England class 5; Middle Atlantic and Southern class 70.

Source: Tariffs published by: New England Motor Rate Bureau
Middle Atlantic Conference
Southern Motor Carriers Rate Conference

Exhibit D-1

A special cost burden on the three northern New England states is caused by the Eastern Central arbitraries on traffic to and from New Hampshire, Vermont, and Maine, but these are likely to be removed in the near future. These arbitraries were required because of the lack of direct carriers, necessitating the interlining of practically all traffic over Boston and the splitting of revenue between carriers. Similar arbitraries were once in effect between New England and the south but were removed once direct service was available. In the past year three carriers have started direct operation between the Eastern Central area and northern New England. As more direct service becomes available the Commission should exert pressure both directly on the companies involved and before the ICC in an effort to have the carriers cancel the arbitraries.

Several other factors peculiar to New England must also be considered. New England is a relatively compact area resulting in a higher proportion of short haul traffic than in other areas. The average shipment in New England moves 96 miles whereas the average in the Eastern Central territory is 450 miles. A high percentage of carriers' expense is related to terminal costs, and if the road haul is short the rate per mile must be higher than it would be for a longer haul.

The geographical location of Boston is about 150 miles east of New York. Thus traffic moving from the midwest will move at higher rates. For example, refrigerators from Dayton, Ohio to New York City in truckload quantities carry a rate of \$2.25/cwt., compared with \$2.51/cwt. to Boston.

AIR

The fact that industrial goods moving by air from Boston to Los Angeles (or San Francisco) pay a higher rate than the same goods moving from the west coast cities to Boston is sometimes condemned as discrimination. This reaction is natural because it seems on the face of it that the cost must be the same. Actually, however, the cost is not the same, and cost is not the only consideration in setting transportation rates, any more than it is in setting any other price. Transportation costs are very complex, partly because of the incidence of threshold costs at various points along the list of cost elements. For example, if the threshold cost of buying an airplane has been incurred, that particular cost component does not increase with each new shipment until the plane is full, when a new threshold is reached. If a terminal is established, its use for an additional schedule does not affect that cost component until a new terminal is required. The process goes on for almost every cost component except fuel. If the product, transportation, were not uniquely perishable, it could be

produced at the most efficient rate and stockpiled to meet demand. But the very nature of transportation is that it must be produced on a regular schedule, as fast as practicable, and if any of it is not used it is wasted. It is as if a manufacturer produced widgets which were picked up by customers at the end of the machine, and if no customer was on hand to grab the next widget, it dropped into a bottomless pit.

Of all the exigencies of transportation cost, the most compelling is backhaul. If service is provided in one direction, the vehicles and their motive power must be moved in the opposite direction, whether there is anything to move or not. In point of fact, it is a rarity for transportation to be balanced. The plight of the New England railroads provides a familiar example. For many years, there have been more freight cars to bring into New England than are needed to haul products out, and the resulting imbalance of car and locomotive productive movement has plagued the roads for a century.

It happens that transcontinental air freight balances in the opposite direction. Raw materials are not moved by air, and the westbound movement of manufactured products represents a greater demand than eastbound. In order to move the westbound freight for more than one day, the planes must return partially empty. Obviously, anything that can be carried in that empty space adds very little to the cost, and if it contributes some revenue, it helps to cover the cost of the whole round trip move. Since the demand for transportation, like the demand for everything else, is greater at a low price than at a higher, more freight will be shipped if the price is lower.

Consequently, the airlines act intelligently and to the best interest of all concerned when they offer different rates eastbound and westbound. If under regulatory pressure the eastbound rate is jacked up to match the westbound, some eastbound freight will not be shipped, the revenue will be lost, and the airline will have to seek the equivalent revenues some other way. If it is required that the westbound rate be lowered, or even that an equal rate be established between, the imbalance of movement will be made greater and the whole problem will be worse. In all of these cases the strong likelihood is that total costs will not be met by total revenue and all rates will have to be raised.

Appendix E

The Need for Transport Data

This report adds one more to the long list of transportation studies which have deplored the lack of basic data. Any effort to analyze either travel or freight shipments soon runs into this lack. The New England Regional Commission may wish to consider establishing a continuing procedure for data collection on a regional basis, including both interregional and intraregional flow. In that event, the following discussion of existing data and the problems involved in further data collection should be helpful.

A. PASSENGER

1. Air

Existing CAB statistics provide a 10% sample of both "true O&D" and "on-line" passengers, a compendium entirely satisfactory for most purposes. (True O&D lists the passenger's individual origin and destination; on-line figures show the total passengers carried between two points, disregarding prior and subsequent legs of the passenger's journey.)

Satisfactory as this information is, it could be improved in two ways. First, it would be helpful to know by what means and from what point a passenger arrived at his original airport as well as similar information at his destination. Second, especially in cases where there is substantial frequency (e.g., Boston-New York), it would be helpful to know how the demand varies throughout the day. In addition it would be informative to have occasional spot checks of socio-economic data, such as age, sex, income, education, residence, occupation, etc. Such a survey was included in a study performed by SARC in 1968 entitled "Competitive Intelligence Report - Transatlantic Market."

2. Highway

a. Bus

Virtually no data of bus travel is available. On the face of it data similar to that available for air travel would be desirable, together with similar recommended additions. Because of the shorter distances of travel and the much lower average revenue per passenger, however, a study would be necessary to determine to what extent the industry could absorb the cost of the necessary reports,

but it appears reasonable to meet this problem by having government bear the cost. If necessary, something should be done to simplify the reporting procedure while keeping the results consistent with the reports of other modes.

b. Automobile

Most important is the establishment of a systematic data collection for O&D information on automobile trips. Such information is now available only in the form of rare spot checks widely spaced in both time and distance. Such data collected on a regular and consistent basis with good geographic coverage would enable far wiser application of resources. The information would be even better if it included socio-economic data. Consulting firms with whom SARC maintains close working relationships have developed procedures for the collection of detailed information on automobile travel.

c. Rail

A 10% sample of "true O&D" and "on-line" passengers on the same basis as current CAB statistics for air travel is the obvious first need. Additional socio-economic data mentioned for air travel would be of further value.

B. FREIGHT

1. Rail

Existing data has enabled measurement of volume into and out of New England with some ease partly because of the corporate segregation of New England railroads. Such data collection will become difficult as the region's lines are merged into larger territorial systems. Since, however, machine accounting has become almost universal, it should be possible to introduce a 10% sample report of all shipments arriving at or departing from New England stations to show in machine language:

Origin and origin carrier
Destination and destination carrier
Intermediate carriers and junctions
Commodity
Weight and number of cars or trailers
Revenue, separated between New England carriers, other Official Territory carriers, and other territories

Providing this information will raise certain problems. Mechanical problems do not appear to be great provided arrangements are carefully made in advance of the prepara-

tion of raw data. It may be easier to change from a 10% sample to sample time periods, but such a shift would reduce reliability somewhat.

The cost should not be great, if a system is worked out in collaboration with the railroad departments who will have to supply the data. It should be borne by government.

The greatest problem will be to overcome the reluctance of the railroads to making the data available. Such disclosure has traditionally been discouraged as a competitive disadvantage. The anti-disclosure provision of the Interstate Commerce Act, Section 15(11) is sometimes so interpreted as to prevent such data gathering and publication.

The 1% waybill sample of the ICC is carefully guarded to prevent any detailed publication which would violate this provision, and even greater care would have to be taken in divulging a 10% regional sample.

Reluctance to provide data might be overcome if carriers could be assured that consistent data from all carriers by all modes would be available to all.

2. Motor Truck

Almost no data are available as to truck volume in the region. Obtaining consistent data such as that described above for rail freight is the first problem, both because the absence of such data represents the greatest present lack and because if data cannot be obtained from trucks it is unrealistic to expect cooperation from railroads in data collection. On the face of it, the same data outlined above for rail shipments would be desirable, but to make the problem manageable it would presumably be necessary to establish a minimum distance of shipment below which data would not be collected. To be useful, such data should be collected from private and contract carriers as well as common carriers. The Department of Transportation is currently arranging for a study of motor freight flow data systems, a study which should reveal the problems and possibilities in this area.

3. Air

No systematic data are available for air freight. It would seem desirable to maintain the same information outlined for rail shipments above, and there should be no insuperable mechanical problems in doing so.

4. Water

For merchandise shipments moving through the Port of Boston, information similar to that described in the rail section is essential to a full understanding of the economic place of the port. To provide complete knowledge, however, similar information should be obtained on New England shipments through the Port of New York. Bulk cargo presumably need be reported only in terms of total weight and area O&D in order to provide satisfactory information.

C. GENERAL COMMENT

It is easy to outline the needs and possibilities of data collection, but the task is filled with tremendous problems of detail. A study should be undertaken to uncover and solve these problems, but not until a policy decision has been reached that the data collection will be supervised and the files will be maintained for the indefinite future by a responsible agency, such as the New England Regional Commission. It must also be determined under what circumstances, and to whom, the data is to be made available. Unless it can be read with reasonable ease by scholars and industrial research people, the very considerable effort is not worth while.

Appendix F

Characteristics of New England-Canadian Highway Travel

Discussion of the East-West highway sometimes involves U.S.-Canadian travel, and for that reason it is of interest to examine the available data. The Dominion Bureau of Statistics at Ottawa publishes monthly data regarding highway border crossings by port of entry for the various Canadian provinces. These data indicate that in 1965 a total of 5,300,000 vehicles crossed the New England-Canadian border between the Atlantic Provinces and Quebec on one hand, and Maine, New Hampshire, and Vermont on the other. Almost 3,770,000 vehicles crossed the New York and New England-Quebec border with 297,000 crossings in Maine, 13,500 in New Hampshire, and 1,223,500 in Vermont. These figures include a substantial percentage of local border traffic. More significant is the border traffic involving over three-quarters of a million passenger vehicles where the duration of the trip was one or more nights. (Exhibit F-1) The Maine-Canadian overnight auto border crossings in 1965 represented a major share, namely 56.7%, of the New England-Canadian traffic. The Maine-Atlantic Provinces traffic accounted for 42.4% of the volume; Maine-Quebec traffic accounted for 14.3%. The Vermont-Quebec traffic was about the same as the Maine-Atlantic Provinces traffic, namely 42.6%. New Hampshire crossings were less than 1% of the volume. U.S. and other non-Canadian vehicles were 52.2% of the total yearly volume, with Canadian vehicles comprising the remaining 47.8% (Exhibit F-2).

State-of-origin data involving U.S. vehicles entering the Atlantic Provinces and Quebec provide community of interest factors. Though these data may include repeat trips and do not indicate the vehicle route, the Maine-Atlantic Provinces data indicate that 30.3% of the passenger autos had as a state of origin points in New Hampshire, Vermont, and states to the west of New York State. The percent of upper and lower New York State vehicles visiting the Atlantic Provinces was not given. (Exhibit F-3) The community of interest between the Atlantic Provinces, the north central states, and the far west is indicated by the fact that 26.9% of the U.S. vehicles spending one or more nights in the Atlantic Provinces were from this part of the United States, representing some 1,100 vehicles on a near-peak day. There is little in other available existing data to indicate the demand for travel between the Atlantic Provinces and Quebec via routes through northern Maine and other northern New England states.

Traffic between Maine and the Atlantic Provinces constituted 42.4% of the total New England-Canadian border traffic involving passenger car vehicles staying one or more nights in Canada, and constituted almost 50% of the total 1965 annual Canadian-New England vehicular traffic. Further data is available to pinpoint the most important U.S.-Atlantic Provinces border crossings. In 1966, about 7,680,000 motor vehicles crossed the Maine-New Brunswick border. Over 40.5% of these crossings were at Calais-St. Stevens, and an additional 14.2% of the annual crossings occurred at St. Croix, some twenty miles south of the Calais-St. Stevens crossing. Thus 54.7% of the annual traffic is concentrated in this coastal area, giving an indication of needs at the eastern end of most east-west highway route projections. It is important that one consider the seasonality of the Maine-Atlantic Provinces highway traffic. January and February traffic is at a low with about 2.7% of the annual traffic volume occurring in these months. In contrast, the long distance travel increases some 7.8 times by July and August with 22.9% and 20.2% of the annual long distance personal travel volume (133,000 vehicle crossings) occurring in these respective months.

Exhibit F-1

Vehicles Crossing New England-Canadian Border - 1965
Remaining One or More Nights

	U.S. and Non-Canadian	Canadian	Total
Maine-Atlantic Provinces	203,076	129,248	332,324
Maine-Quebec	40,131	72,215	112,346
New Hampshire-Quebec	3,137	1,844	4,981
Vermont-Quebec	162,737	170,828	333,565
Subtotal New England-Quebec	206,005	244,887	450,892
Subtotal Maine-Canada	243,207	201,463	444,670
Total New England-Canada	409,081	374,135	783,211

SOURCE: Dominion Bureau of Statistics, "Travel Between Canada, The United States and Other Countries," 1965-66.

Exhibit F-2

Vehicles Crossing New England-Canadian Border - 1965
Remaining One or More Nights
(Percent)

	Percent of Total New England-Canadian Crossings		
	U.S. and Non-Canadian	Canadian	Total
Maine-Atlantic Provinces	49.6	34.5	42.4
Maine-Quebec	9.8	19.3	14.3
New Hampshire-Quebec	.8	.5	.6
Vermont-Quebec	39.8	45.7	42.6
Subtotal New England-Quebec	50.4	65.5	57.6
Subtotal Maine-Canada	59.4	53.8	56.7
Total New England-Canada	100.0	100.0	100.0

SOURCE: Dominion Bureau of Statistics, "Travel Between Canada, The United States and Other Countries," 1965-66.

Exhibit F-3

Origin by State or Region
U.S. Automobiles Entering Atlantic Provinces or Quebec
Remaining One or More Nights - 1965
(Percentage Distribution)

	Atlantic Provinces (%)	Quebec * (%)
Maine	15.9	5.8
New Hampshire	2.7	7.0
Vermont	.7	14.3
Massachusetts	21.7	13.7
Rhode Island	1.5	2.3
Connecticut	8.4	7.2
New England States	50.9	50.3
Mid and South Atlantic States	21.2	41.2
Southern States	1.0	.9
North Central and Western States	26.9	7.6
Total	100.0	100.0
Total Vehicles	173,519	360,774

*Includes New England and New York border crossings - state of origin data for New England - Quebec border crossings only not available.

SOURCE: Dominion Bureau of Statistics, "Travel Between Canada and Other Countries 1965"

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